# School Shop

vol. XVII no. 8
APRIL 1958

**LABOR LOOKS AT INDUSTRIAL EDUCATION**

Suppliers Directory

New Instructional Materials

Directory of Officials

Cover story: Portals of the State Trade School at New Britain, Conn., are framed by journeymen plying their various crafts. For thoughtful comments on industrial education by representative leaders from the ranks of labor, as well as by Secretary of Labor James Mitchell, see pages 7-52.

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BPA

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# School Shop TALK

## COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

### What Labor Wants

This issue of SCHOOL SHOP is unique because, to the best of our knowledge, no publication before has asked spokesmen for labor to write about the program of industrial education in the schools. With many young people now in shop courses destined to become members of trade unions when they enter industry, it seemed appropriate to us to ask representatives of labor for their point of view on these courses, particularly since we asked representatives of industry to do the same in a special issue not long ago.

Somewhat surprisingly, labor and industry are remarkably similar in what they would like industrial education to do. For instance, spokesmen for both think that school-shop training should emphasize the "fundamentals" so that the student finishes school with a good idea of the "whys" as well as the "hows." While they do not spell out exactly what they mean by the "fundamentals," it is probably safe to conclude that they want students to have a basic understanding of materials, processes, and operations that are standard within a craft or industry, as well as competence in the three R's.

Both want a better acquaintanceship by students and teachers with industry, particularly through plant and shop visitation.

Labor and industry feel that there should be a closer liaison between the schools and their groups. They would like representation on joint apprenticeship committees, consultation about the curriculum, as well as visits to industry mentioned above, and an opportunity to discuss school problems.

Both groups feel that greater emphasis in teaching should be placed on craftsmanship and pride of workmanship. The good journeyman has this attribute and management also wants workers to have it.

On the other hand, labor would like schools to develop certain viewpoints in students that industry does not mention. Among these is the concept that labor is not a commodity but *people* with desires, aspirations, and feelings who merit treatment as personalities of innate worth.

There is a strong desire indicated in these articles by labor representatives for upgrading of members of the work force so that ultimately some of them can become managers and shop owners. This, in fact, is a common process in industry and the various crafts.

Labor realizes that management must make a profit to stay in business and is in agreement with this objective. Labor spokesmen point out that if there is no business there are no jobs, as well as no better standard of living for workers.

The schools are asked by labor to do certain things which are not now being done or are being done inadequately. One area in particular which labor thinks could be improved is guidance. More and better guidance is desired with a realistic concept of the needs of the skilled trades for workers with aptitude and intelligence who are given an accurate picture of the occupation. Another area in which schools are remiss is in giving students knowledge of the trade-union movement and of union operations and procedures.

Finally, labor representatives think that special skills can be better taught on the job through apprentice or other training programs than in the schools. They want students to have a basic understanding of fundamentals but not get a little specialized knowledge so that they have the mistaken notion that they are the equal of journeymen.

Not many union members or officials are really acquainted with the objectives and programs in industrial education, except the related instruction given to apprentices. They are unfamiliar with the differences between industrial arts and trade training. In this respect they are no different than the public generally. The fault lies with poor community relations on the part of industrial-education people so that the public, including labor and management, is uninformed concerning the objectives, methods, and curriculum in the field.

However, progress has been made in recent years in dovetailing student needs, union programs, management standards, and educational purposes. Because the unions have supported schools historically, and particularly vocational education, the schools should be cognizant of this segment of our industrial society.—*L.W.P.*

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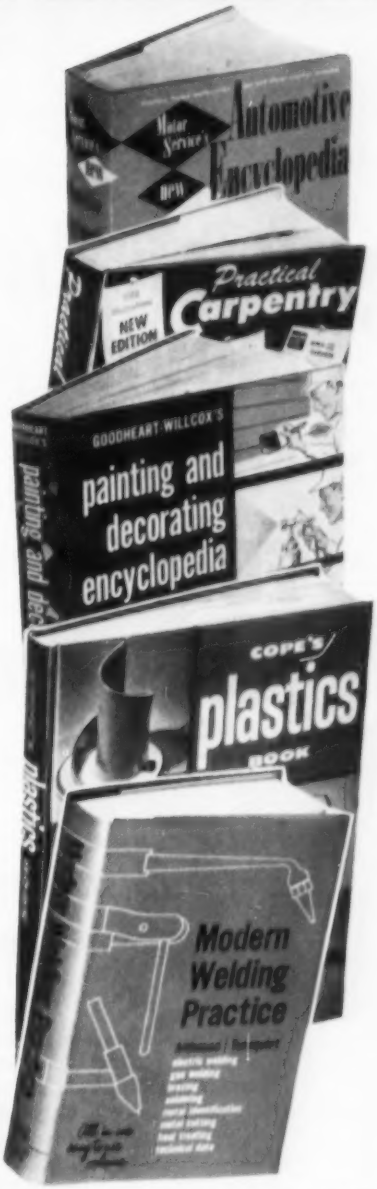


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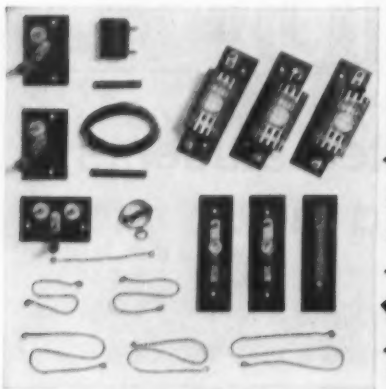

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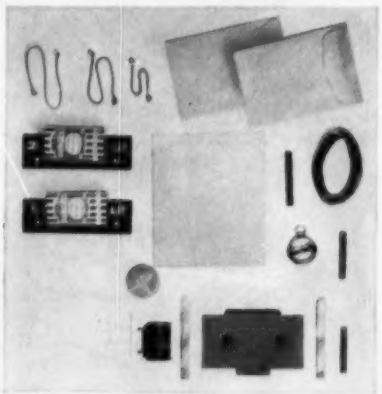

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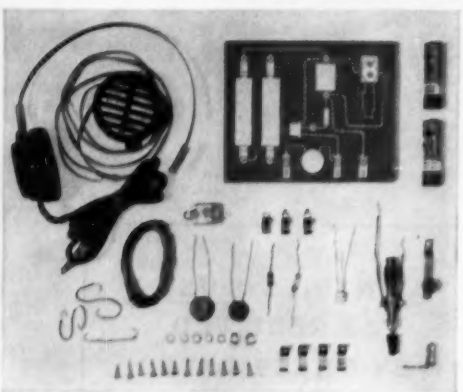

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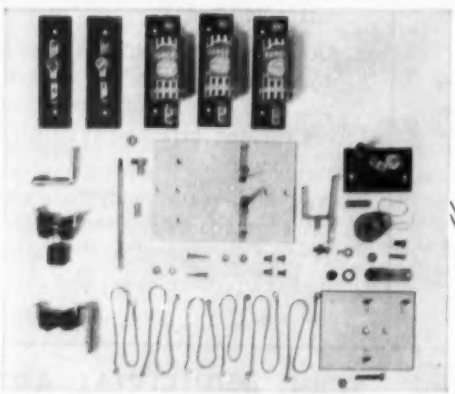

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Secretary of Labor James P. Mitchell addressing the opening session of the Labor Department's meeting on "Education and Employment" at Washington in November. Pictured left to right are Secretary of Health, Education, and Welfare Marion B. Folsom; Secretary Mitchell; Under Secretary of Labor James T. O'Connell; and Assistant Secretary of Labor Newell Brown. Fifty representative educators attended the meeting.

**Skills are needed for the future**

# Education—The Vital Element

*By James P. Mitchell*

Secretary of Labor, Washington, D.C.

CHALLENGED by the changing nature of work in an industrial society in which rapid and radical technological change is almost commonplace, the American worker has very large areas of responsibility and opportunity.

He has the responsibility to get the kind of education and training that will make him the skilled, creative worker he must be in order to compete and contribute in the complex labor force of the future. And he ought to have ever-increasing opportunities to avail himself of that kind of education and training.

In any discussion of the acute need to develop quality workers for our expanding economy and our vital defense system, the role of industrial education is of high importance. Much of the load in the motivation, preparation, and development of young people for jobs in skilled and creative occupations necessarily falls on the vocational schools, as it falls on the purely academic high schools, on the grammar schools, on the colleges.

When we speak of the need to identify and develop skilled and creative manpower we are not dealing in ideals but in hard necessities, the facts of life.

We must develop skills for the future from our present manpower supply. The nation cannot expect that the workers it needs will fall from heaven. Preparing for the future comes down to a question of coaxing the best out of the people who are available here and now. The fruitfulness of American labor is the paramount issue of an era marked by great technological complexity and promise—and by persistent international strain. Only the most virile kind of a national economy will suffice to meet the needs of our expanding population and the

demands of our defense establishment.

The economy must grow enough by the year 1965 to provide $560 billion in goods and services for a population exceeding 193 million. It is true that the labor force will include 10 million more workers by 1965 and, in terms of quality alone, this would seem to be an adequate increase—especially since machines and industrial methods are improving so steadily.

But the very machines and techniques which promise such thrilling improvements in efficiency and productivity also demand a very special kind of manpower. And what we have already seen of industry's hunger for skilled workers is a powerful clue that we may be confronted, in 1965, with a painful shortage of capable people to make, man, and maintain those wonderful machines that are now taking shape on the drawing boards of industry.

Recent studies by the Department of Labor indicate that an adequate labor force in 1965 will require two million additional professional and technical workers—engineers, teachers, scientists, draftsmen, physicians, and so on. We will need, also, an additional five million skilled and semiskilled industrial workers, and 4½ million more managerial, clerical, and sales workers. At the same time, the number of unskilled workers and farmers and farm workers will have declined.

From what sources will we draw this highly trained and highly skilled labor? We will have 5 million more workers 45 years of age and older and 4½ million more youngsters under 25 than we have at present. There will be no increase in the prime working age groups between 25 and 44 years of age; as a matter of fact there will be 750,000 fewer men aged 25 to 34—a decline only partially offset by a 600,000 increase in the 35-to-44 age group. Of the 10 million net increase in workers of all ages, more than 5 million will be women and over a million will be members of minority groups.

Under today's hiring standards, workers with these basic characteristics are not the ones whom most employers prefer to hire. Yet this labor supply must be used to the best advantage because it will be all we have. It is perfectly evident that we must move now to provide opportunities for these people—women, older workers, minority workers—to acquire the skills which the industry of 1965 will need.

And it means that the young people who are now in high school are going to need an extra measure of skill and knowledge in order to make up for their relatively small numbers. To the school administrator and to the teacher, this means increased effort—in addition to what is already a heavy load—to give students the kind of strong background they will need to get the most out of apprenticeship courses, on-the-job training, and training on higher levels.

Education, industry, labor, and government—all have vital roles to play in the future development of the labor force. A skilled, creative, versatile labor force is the invigorating factor in our efforts to achieve a more productive industry and an increasingly just and happy society.

> *Between the ages of 14 and 24, most individuals in this country receive the education and training which determine the occupational level at which they will spend most of their working lives. The size of this group, at any point in time, determines the number of additions that will be made to the nation's labor force during a specific period ahead. The quality of the education and training provided for this age group affects, to a large extent, the skill level of the population for many decades to come.—U.S. Department of Labor.*

Such a labor force cannot be created overnight. The acquisition of skill is an arduous and time-consuming process. It begins in the home, is nurtured in the schools and colleges, and is brought to fruition on the job. But it does not stop there. Workers must constantly adjust to technological change, adapting their skills to new techniques, building new skills. Training and education are lifelong processes.

For the boys and girls who are today in the elementary grades and the early years of high school, the process is just beginning. Their need for competent, imaginative teachers and a well-rounded course of study is immediate, for they will be the core of the labor force of 1965—and of 1975, 1985, and beyond.

The character of our employment market is such that a high-school diploma is fast becoming the young jobseeker's minimum credential; the nuclear physicist needs more education than the machinist, but both need the same *basic* education. Industry makes a realistic argument for adequate education when it points out to young people that it has increasingly little use for the untrained.

When this is so patently the case, it makes sense for all the forces of the community to combine in an effort to equip its young people to be the most productive and skilled workers it is possible for them to be.

The community which does the most to develop the skills of its own people, and keep them at home, very likely will find itself in an advantageous competitive position in years to come.

Every community will want to take a fresh look at its school system in the light of its own manpower needs. School-industrial committees might be formed to determine how industry and government can aid the schools in equipping youngsters for a satisfying future in the workaday world.

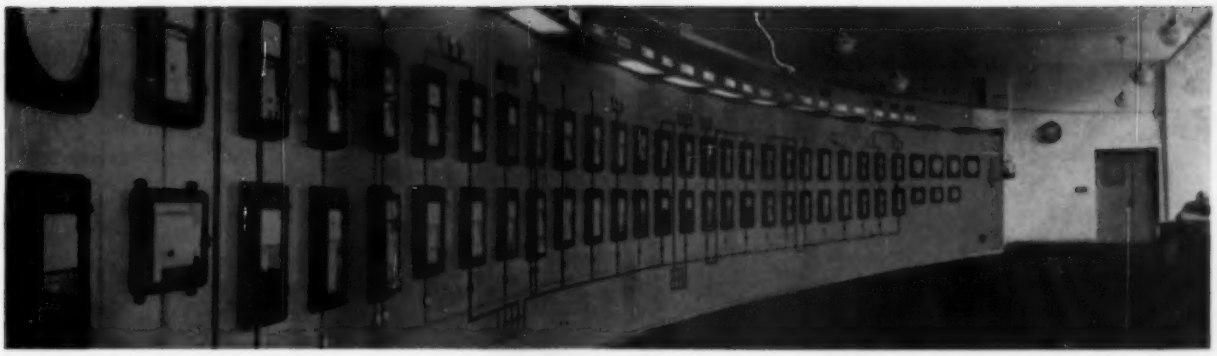
Endless ways must be found to bring home the importance of training to youth and to provide the incentives and the encouragement which youth requires.

Other activities in which exploration might well bear lasting profit include career days to inform students of opportunities in local industry and to motivate them to prepare properly for hometown careers; a well-planned and lively program to keep teachers abreast of changes in technical needs and processes; an arrangement under which industry could supply equipment to the schools for vocational training; cooperative programs in which vocational students could divide their time between the classroom and the job as a means of emphasizing the importance of education to youngsters who might otherwise quit school and take a job which would not use their best abilities; and the establishment of a scholarship committee to assemble information on sources of financial assistance to capable youngsters. ★

### Labor Education Institute

A National Institute of Labor Education was established last October with temporary headquarters at Madison, Wis., as a result of interest shown by a number of universities, labor unions, foundations, and civic leaders in the creation of some instrument which, on a national basis, will foster experimentation in the field of labor education and increase the educational opportunities provided for workers by nonlabor agencies such as universities, libraries, and voluntary groups.

The objectives of the organization are to: (1) assist workers, through education, to develop their maximum effectiveness as individual human beings and as citizens of a free society. (2) Further the growth and development of labor union members as democratic and responsible participants in labor union affairs. (3) Aid in the integration of workers and unions into the life of the community and nation.



An international view of

# Technological Advance and the Training of Young People

*By David A. Morse*

Director-General, International Labor Office, Geneva, Switzerland

THE basic conclusion to be drawn from study of the impact of technological advance is that it is imposing higher skill requirements in some areas of the industrial process and is changing skill requirements in many areas of the economy.

Both education and vocational training will have to be adapted to these changes. The extent to which this is done, and done in good time, will determine in no small measure the facility with which society can adjust to the technological innovations penetrating the industrial world.

### Readjusting the Educational System

So far as education is concerned, the first need in most countries is for better and longer basic schooling. With the possibilities of higher income per head brought into being by automatic technology and other developments, is there any reason why social goals should not be raised and more years of basic education provided for young people? Is this not essential in order to develop the intelligence, flexibility, and versatility necessary for meeting the changing requirements of the industrial and labor world?

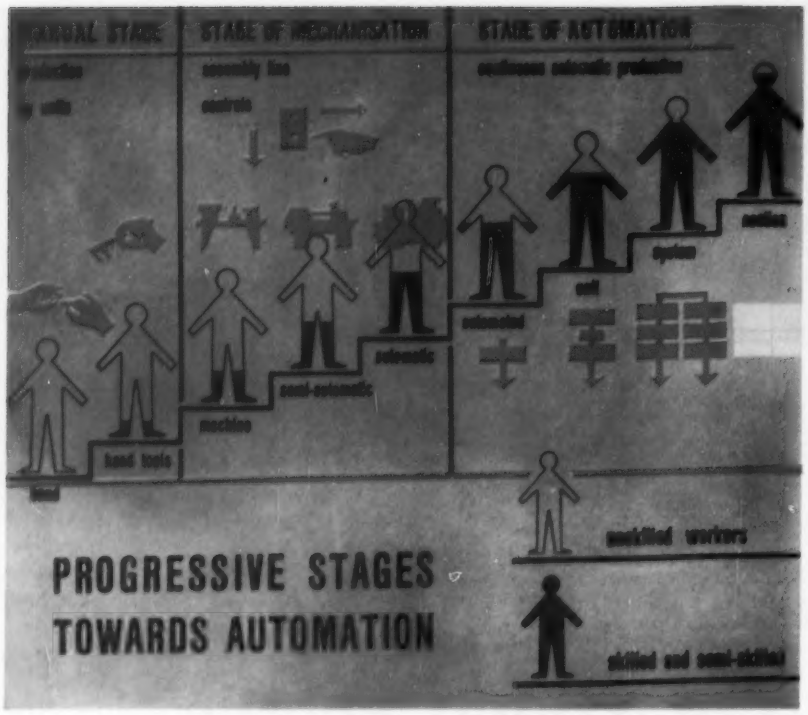
The length of schooling is only one factor, albeit an important one, in the revision of basic educational policy in terms of new needs. There is also a need to readjust the educational system to fit more closely the requirements of a society in rapid technological evolution. Certain subjects—mathematics, science, and philosophy in particular—may have to be given greater emphasis in the curriculum. Many other changes may have to be made to orient education towards the new industrial society growing up on the basis of modified technology.

This requires a redefinition of the goals of education. For many years, industry and agriculture have raised their skill requirements; and educational facilities have been improving. Often, however, and particularly in the less developed countries, there is considerable unemployment among the educated classes side by side with shortages of technologists and other kinds of highly skilled workers. This seems to indicate some lack of balance and flexibility in the educational system, which, in many countries, may slow down the rate of technological advance and make adjustment to change still more difficult. It suggests the need for a new bias in education, a twentieth-century bias to replace the nineteenth-century European bias that still colors the educational system of so many countries of the world. Intrinsic values of the old system need not be lost in the process of change, but new requirements for knowledge can be met.

Finally, it must never be forgotten that good teaching is the key to good education; and much must be done everywhere to equip the schools with competent and devoted teaching personnel, alert to the needs of the future as well as conscious of the lessons of the past. Significant changes are now taking place in the training of teachers and in the educational methods used in the schools.

### Vocational Training Essential

No matter how broad and resilient




the educational system, much of the immediate impact of technological change has to be absorbed in the area of vocational training and above all in the area of youth training.

Many countries will have to expand their vocational-training facilities at all levels to supply the qualified personnel required to run and to maintain and repair the machines and to go into the laboratories, machine manufacturing plants, and tool rooms where the new products are developed and where the machine tools and the automatic machines are built. More specifically, this means that a higher proportion of the recruits to industry will be needing secondary technical education or training in vocational schools, school workshops, or by apprenticeship—up to and beyond the skilled-worker level. In some areas, such as Central Europe and the United Kingdom, there already exist youth-training systems which cater to the training of a fairly satisfactory proportion of young people entering industry and which include both theoretical and practical training and instruction. In other countries, including France and Sweden and many of the industrially less developed countries, steps have recently been taken to expand youth-training facilities considerably.

There is a need to redefine the program in terms of current needs. The changing skill requirements of industry have to be directly reflected in the vocational training of young persons. In many countries—the more developed as well as the less developed—there has been what amounts to an overemphasis on classical trades (those of, say, blacksmiths, foundrymen, plumbers, tailors, and bricklayers) which are gradually losing their place as key trades in industry or are otherwise changing their character quite substantially.

In many countries, too, vocational and technical education appear to overstress basic technical knowledge and training in manual skills while the importance of training in organizational and supervisory skills and of giving students an understanding of, and skill in, handling modern industrial equipment and procedures is being underestimated. Training for new trades needs to be developed. For instance, repair and maintenance of television cameras and sets, or of electronic computers, require new knowledge and skills different from those needed in any of the traditional trades. New techniques of building, making extensive use of prefabricated standard elements, require new types of skilled building workers—house assembly technicians possessing basic skills in several of the traditional trades.

### Theory vs. Practice

Some observers suggest that the training of young skilled workers will become more intensive and more technically oriented. It is suggested that there will be relatively more emphasis on formal training and on theoretical instruction and relatively less on practical workshop experience. (In the U.S.S.R. recent changes in general and vocational education show a shift towards more intensive work in science and mathematics and a distinctly greater emphasis on more theoretical training at the expense of the practical training hitherto given special importance.) Many believe that youth training should aim primarily at supplying the foundation of technical knowledge and attitudes which will make it possible for the young trainee to undertake many different kinds of work in a broad interindustrial field. It seems to be widely agreed that the institutional training of young persons should give priority to theoretical instruction with adequate arrangements for extensive laboratory or workshop experience in basic mechanics, physics, chemistry, electricity, and other technological sciences, but that skill training on the job will remain important as a means of adapting this knowledge closely to industrial requirements.

Indeed, the importance of systematic on-the-job training may well be enhanced by recent technological changes. This, at any event, is the view taken by many leading industrialists and trade union officials. The President of the Canadian Manufacturers' Association, for instance, has recently stressed that automation and other forms of technological advance make the need for apprenticeship more than ever pressing. Similarly the Secretary of the Australian Apprenticeship Commission has forecast that automation will certainly change, but will raise, apprenticeship needs and standards.

### Changes in Apprenticeship

Some industries with highly automatic production but lacking regular in-plant training schemes have introduced new schemes. The chemical industries in the Federal Republic of Germany and in the Netherlands, for instance, have recently developed apprentice training to cater to the training of highly qualified workers to take charge of automatic production and controls. In the United States new apprenticeship schemes, designed to meet specific needs of automation, were launched during 1956. One covers training for electronic laboratory technicians and another training for machine-tool mechanics dealing exclusively with machines used in automatic processes.

Other observers, while admitting that intensive youth training will be required, forecast that automation will be the end of old-style apprenticeship for young

persons. Most agree that radical changes in apprenticeship methods are going to be required, to correspond to changes in the types of skilled trades for which young people are to be trained. Many suggest that a new emphasis will be placed on group training for young persons, with alternate periods of study and work.

Whatever happens to apprenticeship as such or to one or another particular type of youth training, it seems probable that technological advance will force greater coordination and integration of the different kinds of training provided for young people and possibly greater standardization of technical qualifications.

Since the newly developing skills require more extensive basic education, the concept of vocational training will have to widen. Education and training are not two separate things. They are related parts of the same process. The greater the emphasis on higher technological education, the greater the need for integrating the channels of education and training. It is thus possible that all forms of education and training will come closer together, and, as one result, vocational training may well gain appreciably in prestige. Moreover, if, as is likely, the tendency is towards longer basic education, training will start at a somewhat higher level and be directed towards somewhat older young people and its purpose, content, and methods will have to be modified accordingly.

The fact that a real and urgent problem of timing is involved in revising youth training is indicated by the recent experience of the Renault works in France. Renault trains 150 skilled tradesmen at its training school each year. In 1955, for the first time, it was not possible to place all these young workers in the Billancourt plant (about 20 percent had to be placed elsewhere). The company's apprenticeship scheme had been unable to foresee, three years in advance (the normal duration of skill training), what skills the works would need. A few years ago milling-machine hands, fitters, and turners were required; by 1955 the need was for machine setters for automatic lathes or transfer machines and toolmakers for plastics. No gap must be allowed to develop between production and training as automation moves forward.

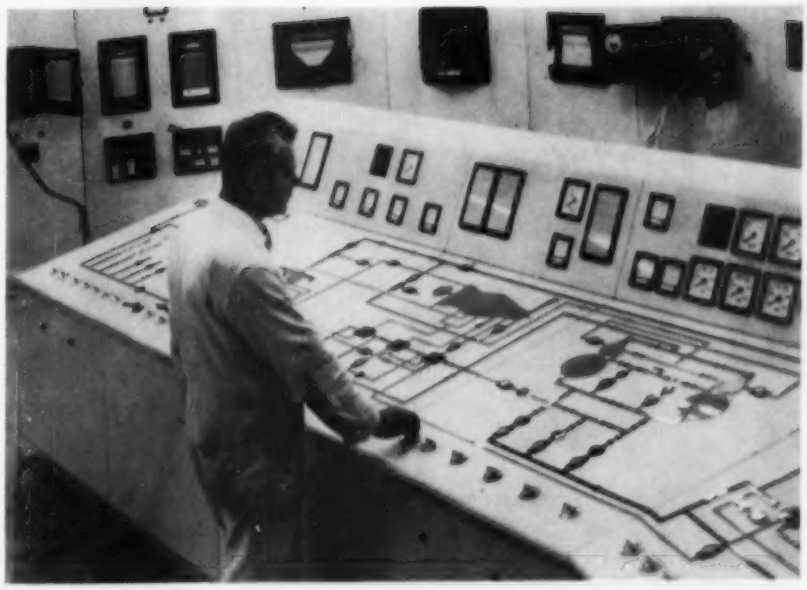
### Guidance Is Essential

The burden of adjustment will fall on vocational guidance as well as on vocational training. Vocational guidance for youth, indeed, becomes of outstanding importance with rapid technological progress. Guidance is not a frill. It is a primary and tested means of relating individual capacity and employment opportunity and in giving it not only must up-to-date information be used but also imagination about the future. It is aimed at helping young people to reflect the changing requirements of the occupational world in their vocational decisions. How much guidance do we need and how much have we got? Is it in tune with technological developments? Is it a continuous part of an integrated education-training process?

A thorough review of all youth guidance and training schemes in the light of the occupational opportunities and requirements of the industrial world is already long overdue in most countries. It is clear that automation, atomic energy, and other technological developments are giving the necessary impetus to getting that job done.

Revision of schemes of youth guidance and training to correspond to modern needs is only one of the matters requiring consideration in this connection. There are many others. Of these two may be mentioned. One is the adequacy of the facilities, quantitatively and qualitatively. The second is the access to such facilities—the spread of opportunity geographically and the widening of access financially so that young persons can afford to receive guidance and to undertake and continue training. It is essential that these points should be considered closely in any re-examination of facilities that takes place, since their solution will determine in large part the practical effect of what is done.

The general thesis which I would put before you is that technological advance and educational advance must go hand-in-hand and that education in the automatic-atomic age must be improved in quality and broadened in scope and outlook. Training is education and we must see that the training of youth is a truly educational experience and is given the priority it merits. ★



New skill requirements come as a result of automation as well as new employment opportunities.

### National and International Unions

Of the 218 international unions in the United States, 111 are affiliated directly with the American Federation of Labor, 34 with the Congress of Industrial Organizations, and 73 are not affiliated with either of the two major federations. However, this should not be taken to mean that a large part of organized labor is outside of the federations, since 7 out of every 8 union members belonged either to the AFL or CIO.

In size the internationals range from the United Automobile Workers with 1,200,000 members, the Steelworkers with 1,100,000 members, to the Sidelographers with 48 members; and from the Carpenters with 2925 local affiliated unions and the National Federation of Post Office clerks with 5000 locals to the Shoeworkers Protective Association with one, and the Welders and Cutters International Union with two local unions.—Reed C. Richardson, *American Labor Unions*, New York State School of Industrial & Labor Relations, Cornell University.

# Labor Looks at Industrial Arts

*By John E. Cosgrove*

Assistant Director of Education, American Federation of Labor and Congress of Industrial Organizations, Washington, D.C.

THE recent manifestations of Russia's technological advances, epitomized by Sputniks I and II, caused alarm in every country of the free world. We all felt dismay, realizing we no longer clearly lead in scientific ability and resourcefulness.

How was this possible? Russia, the most backward European nation in 1917, apparently has wrested world leadership in technology away from us, at least temporarily. The answer lies in the emphasis Russia has placed on education. Since the inception of the present Russian state, education of the young in communist ideologies and scientific processes has never waned. Eleanor Lowman's report, *Education in the U.S.S.R.*, published by the U. S. Office of Education, reveals how far they have progressed in this area.

This is not to imply, of course, that we should make a mad rush to copy Soviet educational principles. Their teaching methods leave much to be desired by our standards. Their goals are the end of liberty. We train our youth to take their place in a democratic society. Theoretically, the choice of a career is left to the individual. Economic conditions have always inhibited this choice considerably. We now realize that too many potential engineers, scientists, and craftsmen have failed to develop, due to this factor of chance. In the light of present developments this waste is tragic.

This loss is not only harmful in terms of what talent has not been developed but also in terms of how we fail to use to full effect the resources we have.

### Reorienting Industrial Arts

There is a growing demand for education and skill. This demand will increase at an accelerated rate in both the near and long-range future.

The past ten years have witnessed a greater change in industrial requirements than the previous fifty. Atomic energy and automation are but two of the many new words introduced into our vocabulary by this revolutionary change. To keep abreast of the possibilities presented by these new challenges we must reorient our industrial-arts programs.

School boards now will require larger budgets to make these new programs operational. This will raise a hue and cry from some. Nevertheless, these individuals and groups must be made to understand that the issue today is national survival, not educational frills.

The equipment and teachers and their qualifications will largely depend on the budget available. Modern equipment but unqualified instructors is as futile a combination as qualified instructors but antiquated techniques and machines. School administrative personnel must do a better job of communicating with the public in conveying the challenge and need.

They must also work at dispelling the widely held notion that the industrial arts are for the slow-learning student. If shop teachers do gear their programs to slow learners only, then we will suffer from our lack of vision.

Guidance is one of the most important functions of a modern secondary school. The relationship between industrial arts and the guidance program can be close indeed. Until now, far too much of the so-called "guidance" has been a process of assigning the slow learners to shop classes and the more rapid learners to academic pursuits. The fallacy, of course, is the assumption that these are mutually exclusive disciplines and, concurrently, that one need not learn well, thoroughly, or rapidly to follow vocational study. Nothing could be farther from the truth.

Our guidance programs must be based on the realization that today's craftsmen, production workers, and technicians require a high degree of skill and must learn new techniques thoroughly and rapidly. Student counseling must proceed from an understanding that vocational pursuits in the Space Age are far from merely a question of manual dexterity.

The role of vocational arts can be to introduce students to the many kinds of vocational arts practiced in society, so he or she may choose more wisely—the choice being one based on at least an introductory knowledge of the subject. A second role, probably of equal importance, can be to acquaint all students, whatever their later studies or occupation, with "vocational" arts. Today all of our people must have a broad, general knowledge of what others in the community are doing and why they are doing it.

### Labor and Management Involvement

Educators must realign their thinking and work more closely with labor and management representatives in planning industrial-arts programs. Too often they isolate themselves and lose contact with the community. Their shop programs suffer as a result. A closer association with labor and management will enable them to keep their programs abreast of the dynamic changes altering our industrial concepts.

A good example of how this combination in a vocational program is beneficial to society is the working relationship between the High School of the Fashion Industries and the International Ladies Garment Workers Union and other needle trades unions in New York City.

There the industrial-education program is a meaningful part of the school's curriculum. The boys and girls are trained in all phases of the needle trades

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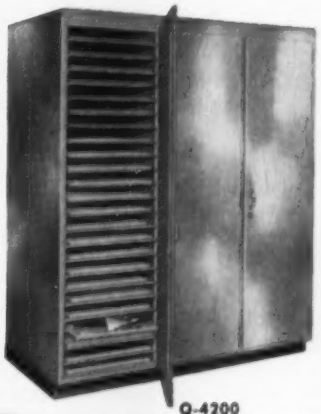

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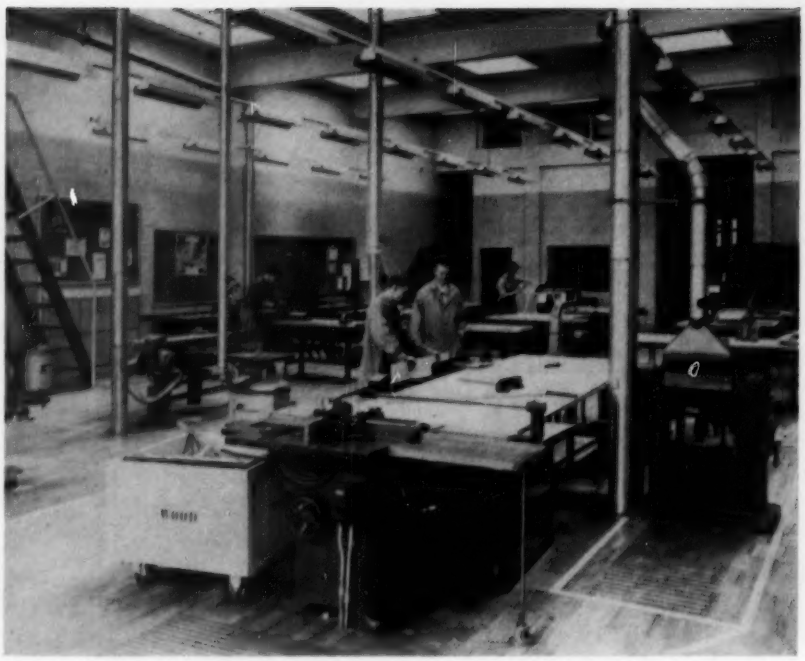
and clothing industry. On graduation they are ready to step into good paying positions in the garment industry because of the thorough training provided them and because the industry is organized. If this program did not exist, these boys and girls might begin in the industry at a much lower rate of pay. It would require years more of work to acquire the skills necessary for advancement to better paying positions.

The advantages of their higher earning capacity early in life is immediately obvious. They are in a position to buy better homes and more of the products of our expanding economy. Everyone has benefited from the foresight displayed by labor, management, and educators working together. This example, unfortunately, is the exception rather than the rule. However, it does point up the possibilities inherent in this type of cooperative endeavor.

The printing, food, and building trades unions of New York City have supported work-study plans. Employers have fully endorsed this program and vocational schools have been established. These contribute much to the support of the trades and industries that make up the city's economy.



Modern equipment and qualified instructors are a necessity for a good industrial-education program. The public must be convinced of this by administrators to get necessary financial support.

### Automation Problems

New types of automatic machines and methods of production are being put to use. They offer promise of better working conditions and a higher standard of living for all. But, as with all human institutions, they present many problems as well.

It has been estimated that 154 engine blocks run through the production line in an hour at the Ford Plant in Cleveland, requiring 41 workers on the line. The same production pace "before automation" required 177 men. Raytheon Manufacturing Company is now able to produce 1000 radios a day with only two workers on the line. Standard hand assembly required a labor force of 200. A large insurance company is going to install a general purpose computer that will do away with between 175 and 225 clerical positions. A ready-mix concrete company has a completely automatic plant that requires no manual labor at any point in the process.

These automatic processes will increase productivity considerably. But without customers for this mounting output, unemployment is inevitable.

The labor market cannot regulate itself in order to absorb the yearly increases in the labor force, as well as workers displaced by automation. The great depression of the 1930's stands as evidence of what can occur when the economy's ability to produce outdistances its ability to consume.

Our industrial-arts programs must expand their vocational training facilities. This expansion will enable adult workers to acquire new skills as well as to train the youth for responsibilities in automated plants.

Vocational directors and teachers should receive salaries commensurate with their abilities. Only devotion to duty keeps many teachers from accepting the higher wages offered by industry. If qualified personnel continue to leave the teaching profession, industry will have to institute its own vocational-training programs. The cost would be prohibitive for all but the larger corporations.

Full-time guidance counsellors will be needed for all phases of the expanded industrial-arts program. They will have the responsibility of aiding the students in the selection of a program for vocational training, depending on the students' backgrounds and capabilities. This in turn will enable the teachers in the shops and classrooms to devote their full time to teaching.

Our school system must help meet the challenge of increased time and shorter work weeks made possible by automation. One positive means to this end is a greater incorporation of the industrial arts in the academic pursuits.

As stated before, the industrial arts must cease being a way-station until the student is old enough to get working papers, or a side track for the slow learner. This tremendous loss of youth cannot continue if we are to remain a first-class nation.

These issues, and many others, require responsible consideration by labor, management, and school representatives. Only in this way can realistic solutions be developed for the difficulties that will arise in carrying this program to fruition.

### Mutual Problems

Labor, management, and educators each have a distinct contribution to give American youth. Labor and management can make the schools' industrial arts more meaningful by keeping teachers abreast of current industrial techniques. Educators can strengthen their program through vocational guidance and teaching geared to changing industrial requirements.

Neither labor nor management nor educators alone have the facilities within their nature to present today's youth with the entire picture of his role as citizen and worker in our democratic society.

In summary, labor stresses the necessity that all who are concerned with education must become increasingly alert to the problem of developing a greater appreciation of industrial-arts programs. The development of skills presented in these courses are vital to continued national progress. ★

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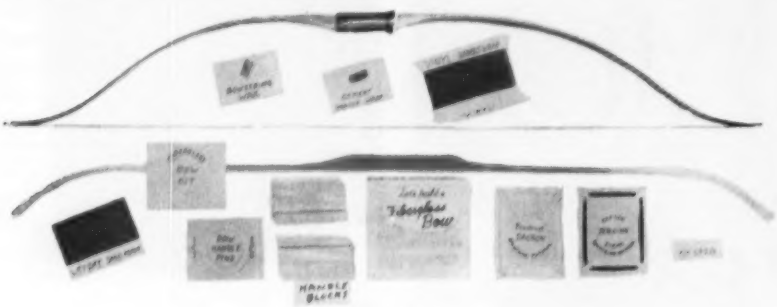

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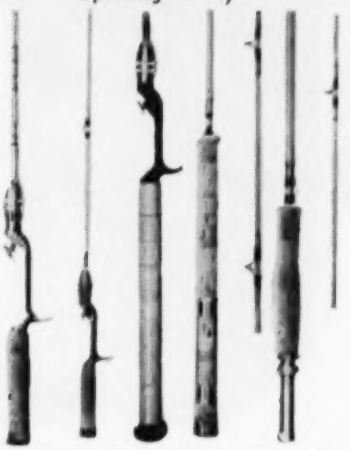

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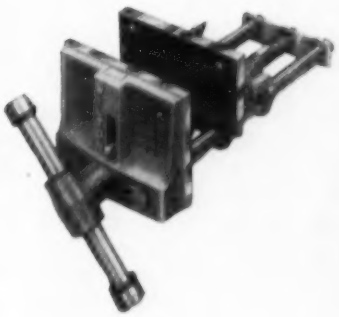

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It takes more than a kid with a "knack"

# Labor Looks at Automotive Education

*By Howard Tausch*

Automotive Coordinator, International Association of Machinists, Washington, D.C.

THE average American motorist loves his automobile. He reads the ads with avid interest. He attends auto shows. He is duly impressed with fancy fins and chrome and sleek swept-back design. He takes pride in rated horsepower, speed, and acceleration. He spends time and care in keeping his car bright and shiny. But, when it comes to the care of the intricate workings of that super-satellite motor under the hood and the equally intricate devices and parts under the frame—well, that is a different story.

When the average motorist, in his role as average home owner, needs any important work on his plumbing or electrical system, he calls in a plumber or an electrician. And he generally tries to make sure that they are competent craftsmen. He does so for two primary reasons: (1) He has been conditioned by social outlook to understand the importance of sound plumbing and electrical circuits; and (2) society, for reasons of public health and safety, requires high standards of workmanship and performance in these fields through licensing and inspection laws.

But his, and society's, outlook on the safe maintenance of that automobile (and over the years he may well wind up spending almost as much money on cars as he does on his home) is the product of an entirely different kind of thinking. Nostalgically, he and the rest of us think of America as a nation of mechanics, and conclude—by emotion not reason—that any kid with a knack for tinkering is fitted by nature to put and keep a car in running condition.

There is no doubt, in my mind, that we are a nation of mechanics, and that it is a good and healthy situation. But, it is a far cry from the Model T to the high-compression, power-controlled car of today. And the kid who may have been able to keep the family jalopy running back in the middle 1920's (was he really as good as we like to recall?) has nothing more today than a good beginning for the education and training he must receive to attain the degree of craftsmanship he must have to provide competent service for the modern-car owner.

### Apprenticeship Needed

In the long run it is going to require considerable rethinking on the part of the motoring public and the automotive industry before we get the kind of service to which we are entitled as car owners. To be sure, certain segments of the industry are now doing a good job in training programs for mechanics employed by their dealers, but this is advanced training for existing mechanics. And in a few areas of the country, and in certain other isolated spots, we of the Machinists' Union have succeeded in establishing apprentice-training programs with the cooperation of dealers.

By and large, however, there is no sound and rational program for recruiting and training competent craftsmen in the trade. And the demands of the trade are mounting. For example, early in January, Mr. Charles E. Heitman, president of the Carter Carburetor Division of ACF Industries, estimated that more than 40,000 new garage mechanics will be needed for this year alone.

If the past is any guide to the future, they will come out of recent crops of high-school graduates, and the chances are they will have no training other than what they may have learned in the school shop and in trying to soup up the old jalopies they picked up on used-car lots for $35 or $50 each.

And that brings us right to the crux of the question: What is the role of the school shop in developing candidates for this important trade? Or, to put it more personally, what can you as instructors in automotive school shops do in the situation?

First of all, we must agree on certain fundamental principles. From my viewpoint, from some years of work in automotive repair and from my present assignment as automotive coordinator in a labor union which has more members in the automotive repair trade than any other union, I offer these fundamentals for your consideration:

1. The modern automotive repairman must be a skilled craftsman, grounded in the fundamentals and familiar with the practices of his trade.

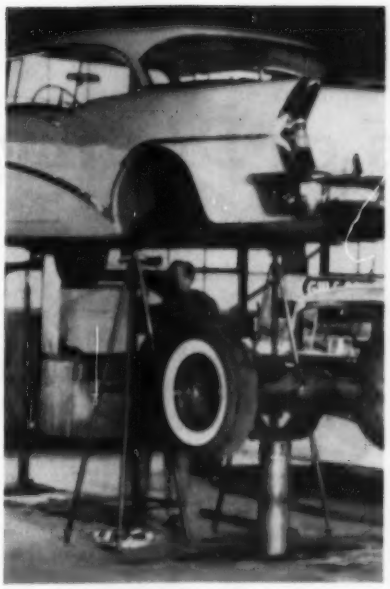
"The modern automotive repairman must be a craftsman. The day of the 'grease ball' has gone."

2. It is impossible in the time and with the equipment available to shops in most of our public schools to give anything beyond a brief introduction to the trade.

3. Because of this fact, it is the function of the public-school shop to provide students with a sound grounding in the fundamentals of the sciences involved in the repair and maintenance of the modern motor vehicle. These are: (*a*) internal combustion, (*b*) electricity, (*c*) hydraulics, and (*d*) pneumatics.

Beyond that, it seems to me that the schools, with the aid and backing of the community and the industry, have the obligation to themselves and to the students to represent the automotive mechanics' trade in the light of present-day facts. The day of the "grease ball" has gone. The modern mechanic is, or should be, well grounded in the basic elements of his trade—all of them—and equipped by training and practice to handle the intricate and costly equipment which the industry has provided for the diagnosis and correction of the troubles into which today's intricate motor vehicles can fall. He is, thanks largely to those of his fellow automotive craftsmen who have organized into labor unions, in a better economic position than ever before. In other words, he is a man of ability and dignity who, to a greater degree than ever before, is compensated somewhat near his true worth.

That is a fact which is not appreciated in the majority of our schools today. And with the present and growing emphasis on scientists and engineers, it is in danger of being even less appreciated in the future. We need scientists and engineers, to be sure. We need doctors and dentists, and scholars, too. But we also need, and sorely need, competent automotive mechanics to care for the nearly 57 million private passenger cars



"It's a far cry from the Model T to the high-compression, power-controlled car of today . . ."

which jam our highways and constitute the foundation for much of our economic and social life. And we won't have *competent* mechanics as long as we skim off the cream of the student crop and "guide" the rest into the vocational courses. Despite the rise in enrolment in colleges, the great proportion of our young people never get beyond high school, often because of economic circumstances.

### What Teachers Can Do

One of the important and basic tasks which you as a shop instructor can perform is to represent the automotive repair trade in its real light in order to attract competent candidates for that trade into your classes. By so doing you will be performing a worthy service—to the young man with that "knack" who will find satisfaction and economic reward in the practice of the trade and to the millions of automobile owners who pay for, but don't always get these days, the services of a competent craftsman when they take their cars into the corner garage or to the down-town dealer.

You are an educator and you know your "trade." I am an auto mechanic, a bit rusty at mine, and the driver of an automobile. I venture the following suggestions from the viewpoint of what I want and think I am entitled to when I take my car into the shop for repairs, from the vantage point of the requirements of the trade as I know it, from past experience and present association, and from the responsibility of my position with a labor union whose object is the development and maintenance of high standards of workmanship in the trade:

Make your students proud of the trade they are beginning to learn.

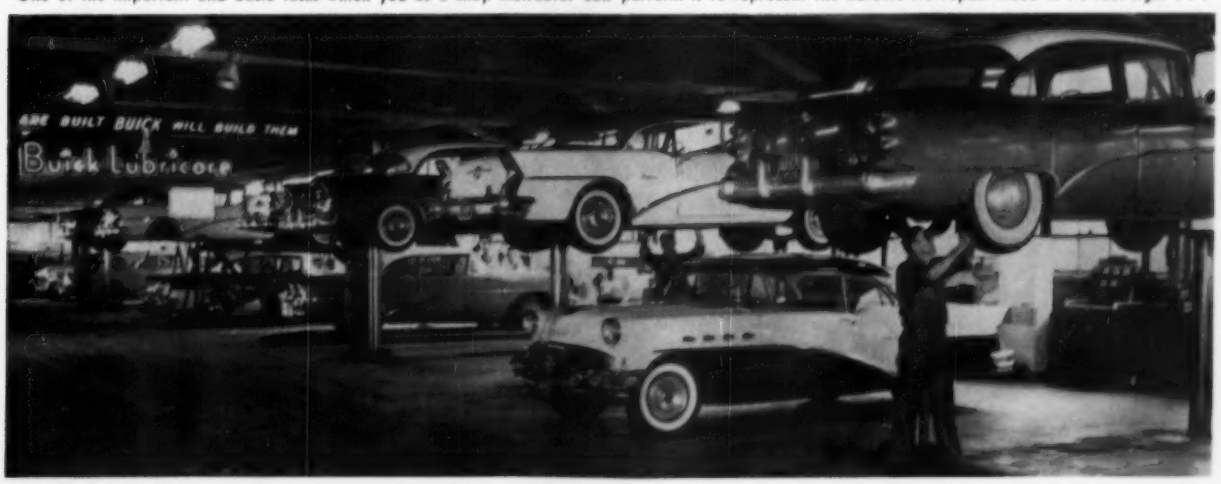
Make sure they have a sound understanding of the fundamentals mentioned earlier (internal combustion, electricity, hydraulics, and pneumatics).

Don't let them use the shop during school hours for tinkering and specializing. There are too many specialists and not enough craftsmen in the trade as it is.

Help them to know that what you are giving them is only the foundation for a career—a necessary, a worthy, and a good-paying career.

When you have done those things you will have served the school, the community, and your students well. You hold in your hands the keys to the success and happiness of many of your students, as well as the safety and the well being of the community at large. Use them wisely. ★

"One of the important and basic tasks which you as a shop instructor can perform is to represent the automotive repair trade in its real light . . ."



**"There is no place for petty politics when it concerns the education of our youth."**

# Labor Looks at Drafting Education

*By Edward J. Coughlin*

Research and Educational Director,
American Federation of Technical Engineers, AFL-CIO, Washington, D.C.

A DRAFTSMAN is an important segment of engineering, construction, and manufacturing, as we all know. His duties lie in the realm of a liaison worker between the originators of ideas—namely, the engineer, inventor, or architect—and the men who make the finished products. It is his duty to explain on paper the steps necessary to transform an idea into a completed unit. He generally works from sketches, field notes, or specifications furnished to him by an engineer, architect or designer.

Most draftsmen specialize in some particular field of work. The largest fields are architectural, structural, mechanical, aeronautical, electrical, marine, and topographical drafting.

Usually a person becomes a draftsman by studying either at a trade or vocational school and later acquiring practical experience. The earlier phase of training is the one we are most interested in for the moment.

### Procedures Simplified

It is a foregone conclusion that now, with industry going through the initial phases of automation, there is an inherent tendency on the part of management to streamline and to simplify drafting techniques. This is, in itself, a laudable procedure, and labor as a whole looks at it in very much the same way it looks at other phases of speed-up. However, one important fact must be kept in mind: While simplification is fine if properly used in industry, it does not necessarily follow that teachers of drafting at the junior-high and senior-high school level should be swept away by its implications.

The primary requisite for drafting education at this level is a thorough study in the basic fundamentals. To eliminate any of these for the sake of simplification would be analogous to sending a football team into a game with a complicated set of razzle-dazzle plays and without the fundamental ability to block and tackle at the proper time. For the beginner, a well-grounded education is the answer. Then as he grows older in experience he will certainly be able to take his proper place in industry's pattern of modernization.

The reader is not to assume by the foregoing that I strictly adhere to the old-fashioned concept of minute detail in every phase of time-consuming exactness. On the contrary! I wholeheartedly subscribe to the theory that drafting instructors should do all in their power to work closely with industry in order to prepare their students for the future that lies ahead of them in their work.

I very vividly recall my early training as a draftsman. Many laborious hours were spent in minute details which later were found to be of limited value, and it is in this area of instruction that I feel great strides can be made toward concise and simplified drawings. Also much time was devoted to ink tracings, which now seem to be completely obsolete. As a result of such experience, may I recommend to the present-day instructors their elimination of such practices if the course of instruction still carries them.

However, one must not assume that neatness and accuracy must give way to sloppiness and slovenly work on the part of the draftsman or trainee. The student must be trained to combine neatness and accuracy with speed. If this is not obtainable, then there is the possibility that the student is pursuing the wrong career and he should be so advised.

### Fundamentals Necessary

In my talks with various instructors I find that they fully subscribe to the theory that fundamentals are an inherent necessity in the training of beginners and that patience must be exercised at this level, far more than at a later period. Once a student has mastered the fundamentals of his calling, then, and only then, is the time to teach him the art of elimination of superfluous details and innovations.

One of my best friends, and undoubtedly one of the neatest and fastest draftsmen in the design division of a large engineering firm, confided in me that at the beginning of his career he was trained meticulously in the details of fundamentals, but as he progressed in knowledge and experience he was able to leave out unnecessary details and still produce a sound, workable drawing. With such being the case, it certainly is gratifying to see that present-day instructors are holding firm in their ideas and are not being stampeded into a position which allows for weaknesses to crop

The primary requisite for drafting education at the junior-high and high-school level is a thorough study of the fundamentals. Patience must be exercised at this level far more than at a later period.

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Sloppiness and slovenly work have no place in drafting. The student must be trained early to combine neatness and accuracy with speed.

up on the part of their pupils at a later date.

### Methods of Cooperation

Instructors and industry certainly can cooperate to the highest degree in working to obtain the end result which will be entirely satisfactory to industry. More and more, teachers find that summertime employment or spare-time employment works toward this end far better than exhaustive study of theory at some school. On the job they rub shoulders with the real problem and they thereby gain a much better insight into the desires and needs of management. Such experience could not be obtained through the study of theory away from the location of the problem.

Please do not mistake my statements above as a criticism of education and theory. I have assumed that the instructor has had proper education and that practical, everyday experience will keep him up to date with the ever changing pattern of industry. As this new experience is acquired, the smart instructor will alter his course of instruction to obtain the proper result without sacrificing the needed fundamentals of the student's education.

Another method of cooperation between instructors and industry is arranging periodic visits by students to various areas of industry so they might learn what lies ahead in their chosen careers. Also lectures by industry representatives in schools is a very enlightening adjunct to instruction.

Another phase of education which must be seriously considered—one which may be largely outside the province of the instructor personally—is the lack of adequate facilities for proper training. While many a parent is ever ready to criticize, he is reluctant to correct the existing circumstances when it hits his pocketbook. The American labor movement has been calling on the federal government as well as the states for some years now to correct the serious situation existing in the field of education, particularly the lack of proper and adequate facilities for the education of our present and future generations. There should be no place for petty politics when it concerns the education of our youth.

I feel that both labor and industry should work more closely with the schools in the development of draftsmen through cooperative and apprenticeship programs. Of course such procedure necessarily will be at a higher level than high-school training, but once such a program is developed, the earlier program can then be slanted towards the preliminary steps leading to the later development. (I mention in passing that the American Federation of Technical Engineers has developed *Apprenticeship and Training Standards for Draftsmen* in cooperation with the Bureau of Apprenticeship and Training, U.S. Department of Labor.)

An interesting development in technical education is discussed in an article written by G. H. Doughty, general secretary of the Association of Engineering and Shipbuilding Draughtsmen of Great Britain. He tells of grammar-school students starting courses for the first time in applied science and workshop theory. This phase of development should be watched very closely by both labor and industry not only in Great Britain but in the United States and Canada as well. It shows that cognizance is being taken relative to the problem elsewhere than in the United States. Our hope is that many other countries may see the need for such a program and immediately take steps to see that it is started and properly developed.

I wish, in conclusion, to compliment the schools for their wholehearted cooperation with labor and industry in seeking to arrive at the proper answers to the problems of drafting education. May they continue to improve this cooperation in order to keep abreast with the changes that are so rapidly occurring in our everyday lives. The recent rapid advances in science and automation make it mandatory that our educational institutions continue improvement in order to meet these changes. The grass roots of education are in the early years of development, and the schools are the source of the raw material which must be trained and properly molded into the draftsmen, engineers, and scientists of the future. ★

Both industry and labor should work more closely with the schools in the development of draftsmen through cooperative and apprenticeship programs.

Fundamentals are a necessity

# Labor Looks at Electrical Training

*By Edward H. Sullivan*

Director, Education Department, Local 3, International Brotherhood of Electrical Workers, New York, N.Y.

Today's electrician has to work on complicated electrical and electronic installations as well as simple wiring to compete in the labor market.

WITH the launching of the earth satellites, the ICBM's, and the trend toward automation in our large industrial plants, the electronic age is surely on us. Every day we read about the inadequate number of scientists and engineers being trained in the United States. Moreover, there is an alarming lack of field men being trained to put into operation and maintain these technological advances we have and can expect in the next decade. Electricity is the prime force which will make all these wonders of tomorrow operate. Therefore, I will try to stress in this article the importance of adequate training and the kinds of training needed in our vocational schools for the electricians of tomorrow.

For the electrician to compete today, he must be able to work competently on the simplest type of housewiring job or the most complex electronic installations because the estimated cost of labor may mean the success or failure of the electrical contractor's bid. As labor union people we realize that in order for workers to improve their living standards, management must make profits. Therefore, we believe that the vocational-school system can only be the basic training ground for the future electricians in the ever-changing electrical world.

Most of the vigilant electrical unions today have intensive apprenticeship training programs and courses for journeymen electricians encompassing the new developments in the field. We feel that the vocational schools must put the accent on the fundamentals—but only the fundamentals—thus giving students a good background to cope with the more complex aspects of the electrical industry.

Apprentices taking their written examination in a New York vocational school. A good apprenticeship program should be a coordinated activity with school, union, and industry all taking active part.

## Basic Needs

First of all let's take a look at the training students receive before entering a vocational high-school course. Education cannot be slapped together. The process starts in the first grade. If it does not start then, it may never start. If a teacher, who is afraid of science or hostile to science or simply ignorant of science, destroys a child's curiosity and his wonder about the physical and mathematical world, then part of that child's capacities has been destroyed.

Our youth must have the highest caliber of teaching on all levels of schooling so that their full capacities are developed. To accomplish this end, something must be done about teachers' salaries. A career in teaching offers so little financial reward, compared to careers in the business world, that we are always in danger of losing good teachers to industry, and we are trading scandalously on the devotion and idealism of those who remain.

The construction electrician is a thinking human being, not a specialist trained to do only one type of work, and, therefore, he must be educated accordingly. Electricity is closely related to mathematics and other physical sciences but equal emphasis should be placed on the student's ability to comprehend what he reads. It is obvious then that the boy, who wants to make his livelihood in the electrical field, should have had thorough training in the three R's prior to his entering a vocational course.

## The New York Program

In the New York City school system, a boy spends his first year in vocational school taking exploratory courses, changing every six to ten weeks to a different type of shop. At the conclusion

of the first year, he may choose the course in which he wishes to major. He can pick the subject he likes or thinks is the easiest for him to complete for graduation. At this time I think it would be ideal to test the students to determine their aptitude before permitting them to continue to study any further in their major field.

In the second year the boys who choose the electrical course start with signal work consisting of circuits for bell wiring using pushbuttons, lever switches, strap keys, door openers, and finishing with annunciator circuits. Part of the time is also spent in learning trade terms, materials, electrical theory, mathematics, and the city's extensive electrical code.

In the second half of the second year signal work is continued, stressing burglar-alarms, fire-alarms, and intra-office communication systems. Lighting circuits are then studied, using open wiring on porcelain cleats, also polarizing and use of switches.

Lighting circuits are again taught in the third year, using armored cable, with further work done on switches. Practice includes miniature wiremold and metal-mold jobs, cutting, bending, and installing the systems. Work on rigid conduit—cutting, threading, bending, and installation—is also part of this year's work.

Much of modern life depends on the ability of the electrician to perform complicated tasks.

In the fourth year work is concentrated on a-c and d-c motors and generators, theory, trouble shooting, and repair. Some schools have to vary the curriculum, depending on the equipment on hand. Radio, armature winding, marine wiring, and service entrance installation are taught where the material is available.

I think the above described course, with a few modifications here and there, is similar to the average trade program given throughout the city. But, for the beneficiary of this type of training to become a competent electrician, he must undergo the intensive apprenticeship training programs sponsored by electrical unions throughout the country. Just to be put on the job with other electricians and receive the rest of his electrical experience in this manner is not enough. It must be a coordinated program between trade school, union apprenticeship, and on-the-job training.

### Dual Purpose Program Better

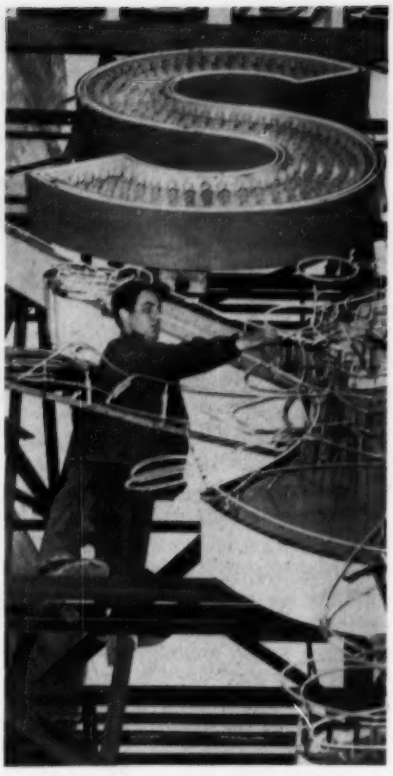
To my way of thinking, a better system offered by some of the vocational schools in the New York area is the dual-purpose program with which, as a union man, I am in full accord. This dual-purpose program is for students with commensurate ability who would like to learn a skilled trade and at the same time prepare to qualify for college admission. We feel that this type of program is most important because it does not limit a young man who at an early age does not know where he is going.

Given the opportunity, many electricians as well as other tradesmen attend night college, earning their engineering degrees, thus making a better way of life for themselves. Without the necessary qualifications, this would not be possible. In this style program, in addition to receiving four periods of trade instruction daily which includes the related technical instruction, the students are given the regular Regents' courses in English, world history, American history, chemistry, physics, elementary algebra, intermediate algebra, advanced algebra, and solid geometry. Students who make adequate grades will be able to meet entrance requirements of community colleges, teachers' colleges, engineering colleges, and technical institutes. On graduation from this course, the student has had sound preparation to enter training to become a teacher of industrial arts or a teacher of shop subjects.

### A TV Experiment

Recently in New York a unique experiment was tried via the television medium. A program, "Careers in Focus," was beamed into all the junior-high schools and the vocational-high schools. It was a panel-type program, consisting of representatives of management, labor, the public, and the board of education. Each member of the panel was a top man in his field. Each told of the importance of students completing their education and the type of jobs and incomes that were available to graduates. Four students also participated and asked the panelists questions that must have been in the minds of many of the nonparticipating audience in their school auditoriums. If educational television was used more to show men working on the same jobs that the students are preparing for in school, many of the courses given would take on new meaning for the students.

As labor people in the electrical construction industry, we realize that in order for our members to look forward to additional gains in our living standards we must also be forward looking in our educational views so that we will turn out fully trained, highly skilled mechanics in our highly competitive electrical industry. The vocational school has to be an integral part of the over-all training received by the finished product —the electrician. ★



High above Broadway an electrician works on a giant spectacular sign to attract the public.

"In manufacturing, emphasis is on testing, inspecting, and repair. In research labs, construction of equipment from blueprints or diagrams is a main job."

**The future holds a lot for those trained in the field**

# Labor Looks at Electronics Education

*By Ben Segal*

Director of Education, International Union of Electrical, Radio, and Machine Workers, AFL-CIO, Washington, D.C.

IN the post-Sputnik clamor for scientists and mathematicians, we must remember that machines and missiles do not spring full-blown from the brains of the scientists or the calculations of the mathematicians. Technological achievements are confined to the realm of ideas until the craftsmen, technicians, and engineers bring them into reality. It may take a scientist or math expert to plan a space ship or a guided missile, but it takes electronics craftsmen and technicians to build it and make it work—and equally important, to service and maintain it.

Millard Cass, Deputy Under Secretary of Labor, has said: "Our country's safety and strength depend on the training and skill of its working people . . . We must view with concern the deterioration of our people's skills in relation to our country's needs, and developments in other countries. If we do not train our limited resources fully and use them wisely, we may find we will lose the battle for technological progress."

The International Union of Electrical, Radio, and Machine Workers (IUE) has been working with the Department of Labor and the Bureau of Apprenticeship to stimulate more apprenticeship training programs throughout our industry. There are not enough students in training to meet the nation's needs. Teachers and curriculum planners should be prepared to demonstrate to the students the great future, the fine possibilities that exist in the field of electronics at all levels of activity. Teachers and instructors should take advantage of every opportunity to assist the young student in selecting a vocation—and should see to it that he gets adequate opportunities to develop his skills, both mental and manual.

To quote Millard Cass again: "Opportunity and incentive for each of our people to develop his talents fully and realize his highest capabilities—in whatever field they may lie—may no longer be a matter of humanitarianism or fairness. It may also be a matter of survival . . . To meet our manpower needs we must counsel the young much earlier and much better. The year 1965 seems far off, but the critically important technical workers we will need to meet our manpower requirements in that year are already well in the educational pipeline at points where they have to make key decisions about their education and training. . . . With periods of apprenticeship ranging from three to five years, the young people who will be journeymen plumbers, pipefitters, electricians, carpenters, and bricklayers of 1965 have already entered high school, or will enter next fall. They have to plan to take enough mathematics, science, and vocational courses to lay a good foundation for apprenticeship."

Many young people who would develop into excellent craftsmen and technicians flounder during their early school period, not knowing what they want to do. The teachers have a job helping them explore occupations.

A largely untapped source of much needed skilled manpower lies with the minority groups of this country—the negroes, Puerto Ricans, etc.—who make up the bulk of unskilled labor. It is important that training programs be set up on a nondiscriminatory basis and that members of these minority groups be adequately counselled and urged to continue their training and develop the necessary skills.

## What the Work Is

Vocational training often lags behind technological advance. Vocational courses must realistically prepare students for actual jobs. Teachers and students should be aware of just what the industry requires and offers.

In general, the electronic technician installs, tests, maintains, and repairs electronic equipment. He diagnoses the

trouble in a piece of equipment by studying its symptoms, makes tests to verify or correct his diagnosis and then makes the necessary repairs using meters, other testing components, and circuits. He replaces defective parts, using electricians' hand tools. After making repairs, he adjusts the equipment to proper operating condition.

In manufacturing, the emphasis is on testing, inspecting, and repair. In research labs, construction of equipment from blueprints or wiring diagrams is a main job.

Automation has taken a giant foothold in the electronics industry. Today at least three automation processes have become permanent parts of radio-TV and parts production: the printed circuit, which eliminates most wirers; the solder bath, which eliminates most solderers; and the mechanical insertion of components, which eliminates most assemblers.

"In general, the electronic technician installs, tests, maintains, and repairs electronic equipment."

"Since the student is more than likely going to be a union member, it is important to understand and appreciate how the union functions."

Automation testing is also becoming commonplace. Virtually all plants under construction today contain unprecedented quantities of automation equipment, and it is already certain that a huge share of contemplated expenditures for future plants planned by the electrical industry will be devoted to automation equipment.

### Automation Means Revision

The rapid growth of automation in the factory is changing the face of the electronics industry. Vocational schools must revise their programs to keep up with these changes. New skills required by the technological changes are often much more complex than the old. Students should be given a thorough grounding in the principles of electronics so that with a knowledge of basic theory, they can adjust to the more complicated operations demanded by the new machines.

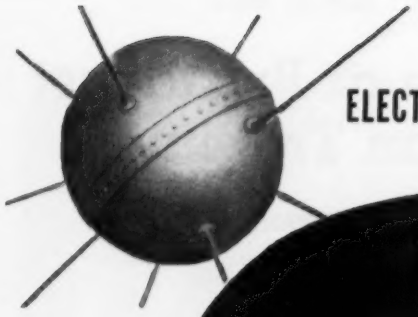
Evening courses are needed for the retraining of employes displaced by automation. IUE has cooperated with public schools in setting up such programs and will continue to do so in the future.

As the IUE sees it, proper vocational training consists in more than learning the physical skills necessary to ply one's trade. A modern plant is not just a location where the worker enters, works at an operation, and goes home. It is a complex social mechanism where many aspects of the employe's daily routine are regulated by union-management relations, by internal union policies, and, indirectly, by the relationships of both labor and management with the outside community. Just as the vocational student must learn how to use the physical machinery of the plant, he must also be taught to use the social and economic machinery at his disposal.

Unionization of the electronics industry is expanding as rapidly as the industry itself. Many of the industrial-education students now in school will one day be union members either voluntarily or, with the growth of the union shop, as a condition of employment. Since the student is more than likely going to be a union member, it is important for him to understand and appreciate how the union functions. He should comprehend the principles of collective bargaining as well as the principles of the electric circuit. He should be as familiar with the working of the grievance procedure as with the operation of the photo-electric cell. The student should be taught an appreciation of the history of the labor movement, its current policies and goals, as well as an understanding of the day-to-day operation of his union.

With the current spotlight on corruption in certain trade unions because of the McClellan Committee investigations, the student's attention should be drawn to what the various unions and the AFL-CIO is doing to weed out corruption, wherever it exists. Those few unions where corruption has been found, have been expelled from the AFL-CIO.

The IUE, the AFL-CIO itself, and many of the unions affiliated with it, have set up ethical practices committees



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to watch over the activities of the unions. The programs, policies, and procedures of these ethical practices committees should be carefully explained to students so that they may get a full and fair picture of the situation.

As was noted above, the manpower resources necessary to meet the increasing needs of the industry are being drawn from the minority groups in this country, and will be increasingly drawn from these groups in the future. Among the skills, therefore, needed by our future technicians and craftsmen is the ability to work side by side harmoniously with coworkers of other races, religions, and nationalities. The IUE feels that attitudes of tolerance and acceptance of these groups should be taught in the classroom along with the technical skills necessary to get along in this vocation.

### Broad Background Needed

The industrial-education program should be broad enough to give the student a background in the social sciences, particularly in economics and political science. One would never think of sending a student into the industry without thorough training in the occupational hazards. The student should also be well grounded in the economic hazards which he faces. He should be taught the legislative process—the way in which through his union, or other organizations, he can be effective in promoting legislation which will protect his economic interests.

The impact of automation on the future technicians and engineers goes beyond the necessity of training or retraining for the skills required by the new technology.

The major problems — overproduction, layoffs, job reevaluations with a possible decrease in rates on the basis of the reassessments, the need for a shorter work week to maintain full employment —these problems are in the economic realm.

Recognizing that the process of automation was already under way in the industry, the IUE Radio-TV and Parts Conference Board developed a comprehensive program and declared in 1955: "Whether automation proves a blessing or a curse, prosperity or depression to the workers of this country, depends on how diligently union and management apply themselves to resolving the many complex problems engendered by devices capable of fantastic productivity."

The future electronics technician, now in school, must be prepared for the challenge of automation and understand the methods by which, through his union, he can cope with it. ★

**Opportunities are limited, BUT they're there**

# Labor Looks at Broadcast Technician Training

*By Mary Ellen Trottner*

**Education Director, National Association of Broadcast Employes and Technicians, AFL-CIO and CLC, Chicago, Ill.**

RADIO and television broadcasting employ a variety of skills and talents. Yet the least publicized but greatest proportion of employes are the technicians—a group of highly skilled individuals who must be able to understand and operate cameras, properly balance the various components that make up the sound, adjust video levels, and record on lacquer discs, magnetic tape, or film.

Even at a small station, many of these talents are needed and an enterprising individual may find it possible to use his inventive talents, to experiment, and become familiar with equipment more readily than he would in a larger operation such as a network station where the degree of specialization is highly developed.

Today a radio-studio control room can house all of the equipment needed in a small control panel where formerly several large racks of equipment and a big control panel were needed.

The first question to ask is: What are the opportunities for employment? The answer, simply stated, is the field is limited. A city the size of Chicago employs approximately 500 people in broadcasting and probably another 150 in the recording field. One of the three large broadcasting networks employs approximately 2000 people in all of its owned and operated stations in six cities. A small radio station, on the other hand, may employ no more than four or five men in technical work. The average television station may employ from fifteen to fifty technical people. The years since 1948 have seen a great increase in opportunities due to the growth of television but these opportunities are limited to new stations going into operation.

There are approximately 700 authorized UHF and VHF television stations in the country, nearly a hundred of which are under construction. Disregarding new stations, a city of a million population with three TV stations and eight radio stations, and approximately 200 technicians, employed less than 20 new men last year. This included replacements and temporary vacation workers.

The next question is whether or not schools can train technicians. Only the trade school specializing in the broadcast field is fully equipped. The early radio men were "ham" enthusiasts, who acquired practical knowledge in their own homes. There were few trade schools. However, a certain amount of on-the-job training has always been considered essential. Most stations and union contracts have a so-called probation period which gives both the company and the man the opportunity to learn whether or not he is suited for the job. Apprenticeship training as such has been frowned on. Instead, union contracts provide a rising wage escalator with increases, generally speaking, after six months, one year, etc., with the maximum reached in two to four years.

High schools and vocational schools can do a job in providing students with a good basic background in mathematics and physics, particularly optics and electricity. The student applies the knowledge he has learned in the shop. Constructing amplifiers, walkie-talkie sets, hi-fi units, or public-address systems are all possible work assignments for high-school students equipped with a basic knowledge of electricity. If possible, it might be wise to keep the shop open outside regular school hours.

Few teachers can be communications and electronics experts, and no shop teacher should hesitate to seek the advice of competent people in the community familiar with the industry. The chief engineer of the nearby radio or television station, the president of the local union in a larger community, or an electronics engineer in the community (preferably someone more concerned with practical application than research) can give valuable advice in planning projects. They can advise on equipment which might be purchased, thus avoiding costly mistakes. Stations may even have discarded equipment which they would be willing to turn over to the school.

*(Continued on page 78)*

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New processes call for new methods

# Labor Looks at Graphic-Arts Education

*By Clarence G. Schroeder*

President, Detroit Printing Pressmen and Assistants' Union No. 2

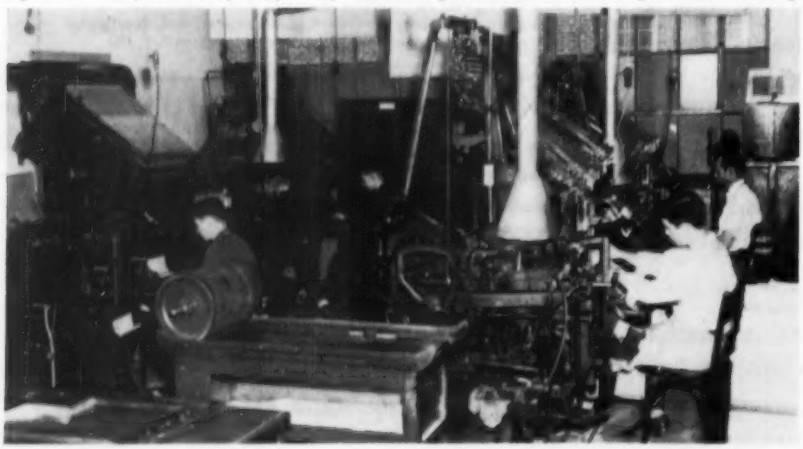
Mr. Schroeder beside a press in Cass Technical High School, Detroit, where he was a student.

WITHOUT question American businessmen have learned to measure and apply many mathematical techniques to new facets of business activities. Relatively little progress has been made, however, in applying quantitative methods to measure education. It appears then that the only method of evaluating the effectiveness of graphic-arts education is to compare the present vocational- and apprentice-training program with the generally accepted standards of the professed objectives of the industry.

The best vocational training given in the United States today is given on the job. The printing trade unions have, from their beginning, recognized their responsibility for supplying well-trained journeymen for the development and progress of the graphic-arts industry. Journeymen craftsmen in this country are among the most highly skilled workers in the world. Nevertheless, they are still in need of training. More training is needed not only to enlarge the scope of skills possessed by the average craftsman, but also to refine and perfect the skill of those considered competent. The national economy needs it. The reputation of organized labor depends on it.

My union, the International Printing Pressmen and Assistants' Union of North America, has spent millions of dollars on technical training and trade educational programs for members. Our Technical Trade School, a modern four-story brick building, was erected at a cost of $1,000,000. It is filled with modern presses, machines, and equipment. Dedicated to printing craftsmanship, the school provides members with an opportunity to learn new methods and processes of printing and a place to acquire further knowledge and skill at their trade.

Student learners working at linotypes in the Memphis Vocational School. The author says such training needs to be preceded by adequate aptitude testing and careful vocational guidance counseling.



Traditionally, we have accepted and recognized apprenticeship as the most effective way of developing skills in our less experienced workers. To insure the best, we have cooperated with management in establishing the terms and conditions of employment and training of apprentices.

### Journeymen Need Training Aids

But setting up apprenticeship programs is not enough. Joint committees made up of representatives from management, education, and trade unions can check to see that proper training is given, but they cannot give the training itself. Training is given by journeymen. Serious consideration should be given to the possibilities of developing more and better technical materials for the use of apprentices while learning on the job, and teaching aids for those who teach the apprentices, not only in school, but also and especially on the job.

Again, I point with pride to my International Union. Our national program of trade education seeks to enlarge the scope of the workers' skills. In addition to apprenticeship training, the union provides a series of home-study courses for the further improvement of those skills when the apprentice has become a journeyman. Through the medium of our monthly magazine, *The American Pressman*, our members are urged to acquire additional training in the more advanced stages of presswork, bringing them up-to-date on more recent develop-

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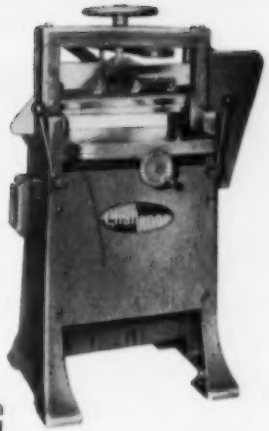

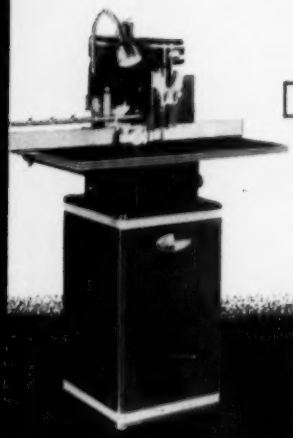

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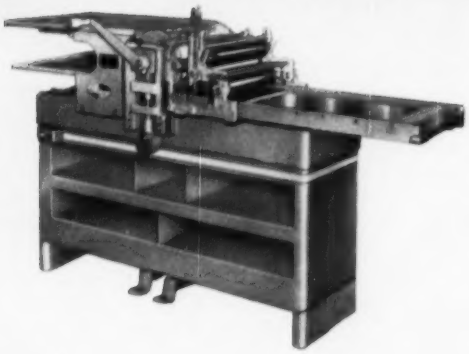

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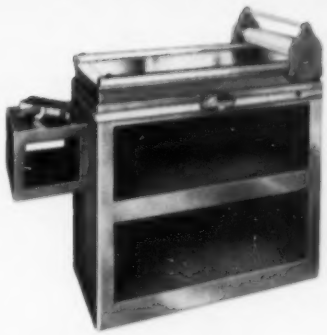

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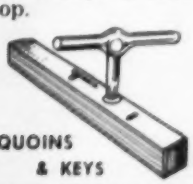

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ments and thus increasing their opportunities for employment.

### What the School Can Do

Most people from the printing trade unions will agree that the public school has a function and responsibility in assisting youth to adjust to our complex industrial society. Nevertheless, we have definite ideas about what is lacking in skill and attitude on the part of the vocational-school graduate entering the graphic-arts industry. But we believe our criticism to be reasonable and our recommendations to be obtainable.

We are convinced the public school cannot train youths for full-scale jobs in the graphic-arts industry. And the schools and instructors should not be blamed for inadequate facilities for trade training. Politically, they must respond to the demands and adjust to the limitations set by parents and taxpayers.

The rapidly expanding newer processes call for equipment and instruction that the public high school can hardly be expected to provide. The various printing trades have become too involved, too complex, and too scientific for the old-time training and instruction methods presently employed in vocational classrooms.

While undoubtedly many of the graphic-arts courses given under vocational-training programs are of value, there is need in many communities for a better coordination of the training given in the school with the graphic-arts industry and with the unions in the field. It seems both wasteful and unwise for schools to conduct a so-called vocational program without establishing functional ties with unions and management.

The school should provide a program which will include the fundamental general education subjects as well as occupational-preparatory services and the high-school youth should experience these together. The public school should not neglect the language, arts, mathematics, and science subjects in favor of a purely occupational program.

It appears to labor that an effective graphic-arts educational program will be possible only when labor, management, and education come to the full realization that the perpetuation of the skilled crafts in the industry is a joint responsibility. Representatives from these three groups should organize a basic course of study for the public schools. This course should provide students with a working understanding of the trade they have selected, but it should not be trade training.

The vocational school should teach simple mechanical knowledge, skill in the correct use of small tools, and the application of safety rules. Representatives from the three groups should prepare and make available material on the history of the printing trade unions for use in the school program. Instruction of this kind will go a long way toward preparing applicants for special consideration for apprentice training in the graphic-arts industry.

### Testing and Counseling Needed

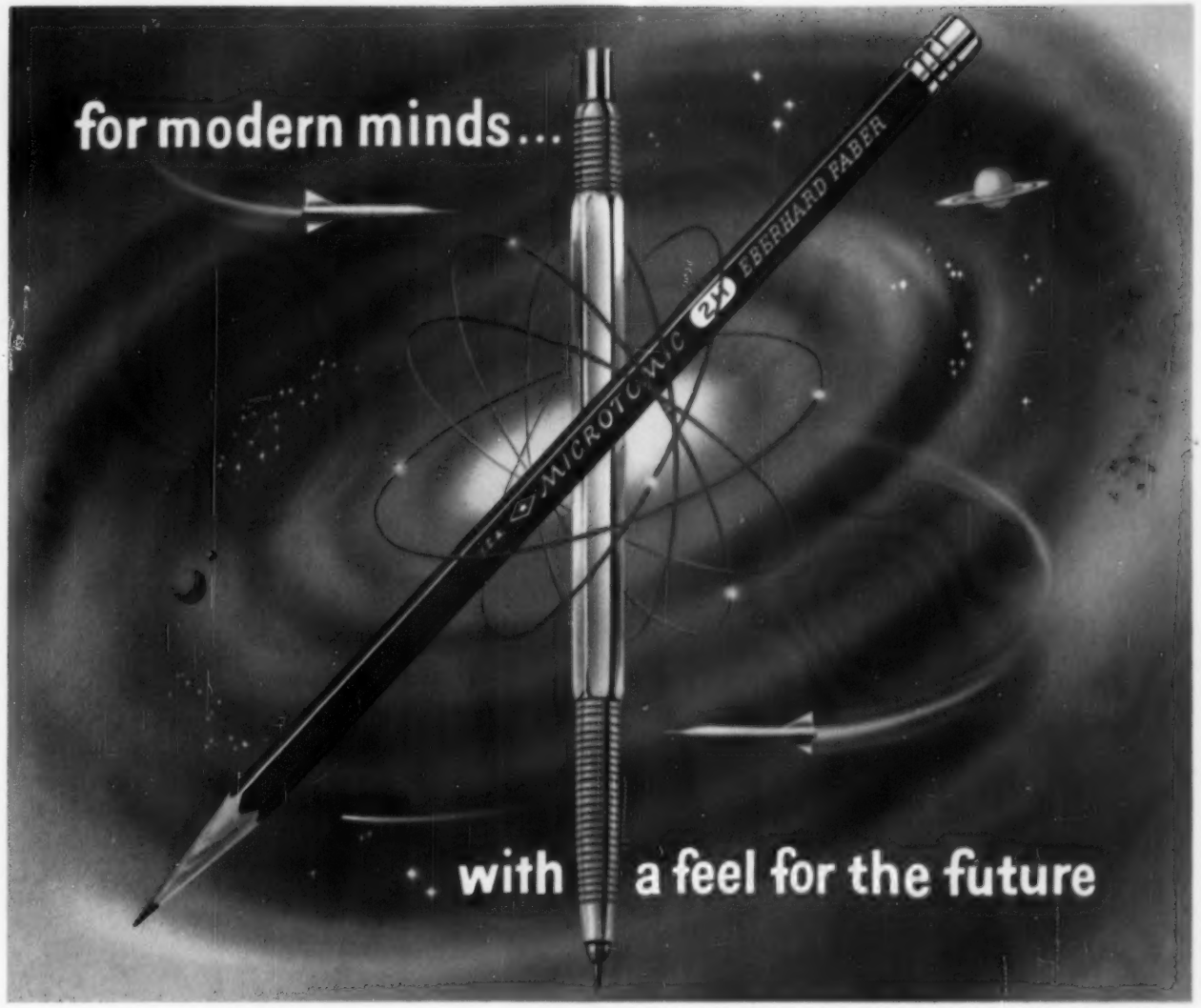
Most vocational schools do not provide a program for testing and try-out to determine whether the student has the necessary aptitude for the printing trade of his choice. In too many communities, vocational education is regarded as suitable for the educationally and socially inferior pupil only. This situation is harmful to the community, to the pupils taking the course, and most of all, to those pupils who do not take practical training because of this prevailing attitude.

Schools should employ trained vocational-guidance counsellors who will study the latest job surveys. A practical guidance of youngsters on the basis of their abilities and aptitudes will make it possible to avoid the "blind alleys" when future breadwinners are ready for specific training. In addition, management is unwilling to invest in a cooperative program of industrial education which permits a youth to quit the industry after completing the cooperative program to attend college.

A representative committee should be assigned to inspect and review school programs annually. There should be a system of annual awards (scholarship or bonus) to worthy students on a competitive basis. The need for continuing professional improvement in the teaching staff for trade competency should be emphasized and membership and activity in labor and industry organizations should be encouraged.

The process of graphic-arts education must not end with youth. It is a continuing, lifelong pursuit. It must keep pace with the demands of growth and change in our industry.

The graphic-arts industry, with its large proportion of highly skilled workers, represents a steady, responsible element of the population and exerts a substantial influence on the economic stability and welfare by reason of its high purchasing power. If our industry is to continue to grow and prosper, there must be better coordination and planning of training programs by education, management, and labor. ★

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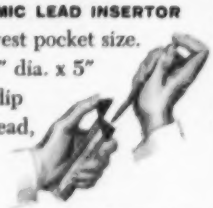

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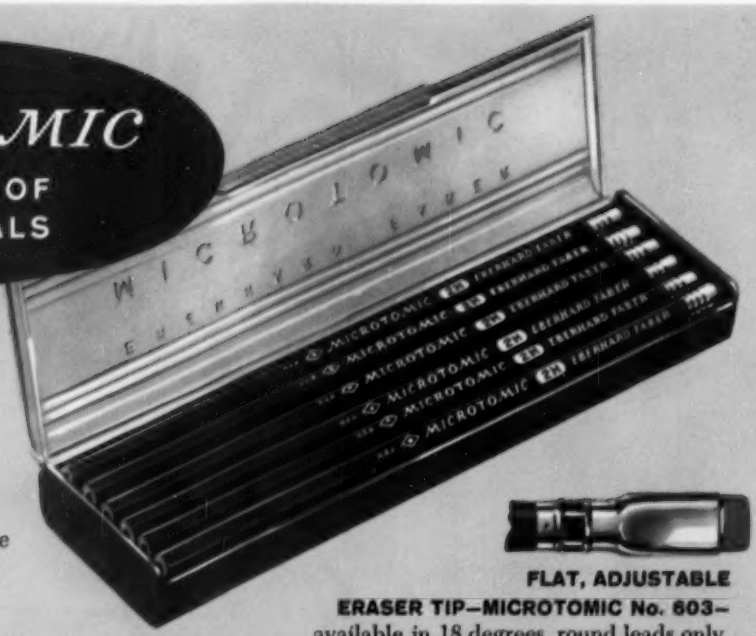


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Apprenticeship is a "must" when

# Labor Looks at Machine-Shop Training

*By William Clitheroe*

Grand Lodge Representative, International Association of Machinists, Washington, D. C.

Right—Apprentice having his work on radial drill inspected by the apprentices' instructor.

PIONEERING a program to establish our system of free public schools many years ago was a concern of the organized labor movement. Today we are still very much concerned with the problem of education and increasingly with vocational education. The labor movement will continue to be conscious of, and interested in, school affairs because we wish to continue our free way of life, a system we pray will never be destroyed.

Throughout the years the labor movement — leaders and members — have fought for increased educational opportunities for all. This is, and will continue to be, a prime objective of organized labor.

The section of the metal-trades industry involving machine work is a vital part of modern life. Look around you, wherever you are, and you will see evidence of the work of the machinist. It may be small or it may be large but it is there. Therefore, we feel that we must stress the importance of training in this field, particularly in the basic fundamentals.

Just what are we thinking of when we discuss "Labor Looks at Machine-Shop Training"? From my viewpoint as a former trade and industrial instructor, the answer is simple. It is in one word—training—the kind of training that prepares a young person for a career in the machine industry, not only for his own future but for the future and well-being of the nation as a whole. Although the issue is simple, the problem is complicated because the machine industry is changing so rapidly.

## Apprenticeship Program a "Must"

While we are willing to cooperate with vocational-education people in order that they may be in a position to "do a job," we must not overlook the fact that the first thing organized labor must do is to insist on a sound apprenticeship training program. It would be misleading to take any other stand and under no circumstances should labor's position be misunderstood.

Young workers and students are being bombarded with offers to take so-called "complete" courses of training in various trades and crafts. This is done with the claim, and apparently the belief, of many vocational-education people that, when such a course is completed, the person will have the right to consider himself a qualified journeyman in the particular trade studied.

We most strenuously oppose this approach. In fact, we look with disfavor on any claim by vocational educators that it is possible for them, through their courses, to provide training that is adequate to make journeymen craftsmen in any of the trades.

It is true that we in the labor movement have not always seen eye to eye with various directors and instructors of vocational education on the kind of technical training a student of machine-shop practice should have before he is turned loose on industry. Perhaps a restatement of the basic purpose of such vocational education would help in arriving at an understanding of the problem. What is vocational education? The most common definition, and one with which I am sure most of you are well acquainted, is the one that calls it the type of education "to aid *development* and training in the arts and processes of the metal industry, to preserve for posterity the skills and knowledge acquired through many years of practical experience and study."

We feel that vocational education should be stressing the basic fundamentals of the machinist's trade when actually much of it is geared to turning out a young person who is equipped to do a few specialized types of work. More on this matter later.

## Guidance Is Essential

It is organized labor's position that the first step in the vocational-education process for a program in skill training is to put the square pegs in the square holes and the round pegs in the round holes. A guidance program which succeeds in attracting qualified young people to prepare for skilled work should and must be a very important part of the vocational program. In other words, we must, with due respect to the individual's own occupational preference, try to gently but wisely steer him to the particular trade within the metal industry for which he is best qualified.

In the event it is the machinist's trade, then our next objective in training suitable candidates for today's industry should be to make their education as *basic* and *broad* as possible.

The key to adequate preparation is flexibility. In training a machinist, we must not lose sight of the forest by concentrating on the trees. Not only must you, as instructors, teach the individual how to operate a lathe in order to turn out a project within reasonable tolerances and precision, but you also must teach him the basic elements of job safety, blueprint reading, applied mathematics and science, the theory of machine-shop operation, and, above all, how to work with people as well as with machines. The art of communicating is no less significant in a machine shop than it is on Madison Avenue.

Organized labor believes that in setting up an over-all program, those concerned must look to the training of the

whole man, not just to the improvement of a semi-automated human adjunct to a machine. We must recognize that formal education is only the beginning of a lifetime of learning.

There is no doubt but that our rapidly growing technological requirements have resulted in a growing emphasis on skill. At the same time, technological advances inevitably alter or change requirements in the skilled, semiskilled, and unskilled work force.

### Some Basic Fundamentals

In reevaluating our thinking about a good vocational training program, special attention should be given the "content" of our training courses in terms of what we know about the learner's basic concepts and understandings of industry, what we know about his ability and performance, and what we know about his interests, mental application, and attitude.

When we understand these aspects, we can turn to the fundamental question of the training program as a whole and how areas of training should be better employed to prepare vocational students to meet present-day industrial needs as well as his personal attainment.

Organized labor agrees that the most important area, that which needs the most thoughtful consideration right now, is in the early stages of a well-founded vocational-training program where we are laying the base for the trainee's future work experience. Too much, we believe, do our vocational schools turn out graduates with little or no fundamental understanding of industry, with no real appreciation of performance requirements, and with no feeling of pride in craftsmanship. We find that many vocational-school graduates come to industry with a highly inflated idea of their own worth. They think that they are ready to act the part of a skilled craftsman when they are actually only ready to begin learning skills that will prove useful both to their well being and to industry.

It is appreciated that acknowledgement of the need for a program to produce skilled workers has been a part of the philosophy of the American Vocational Association. Recently at its annual convention in Philadelphia, a resolution was adopted which in part resolves: "that we reiterate our staunch support of this important kind of training and urge trade and industrial teachers and officials to continue to cooperate fully with labor, management, state, and federal apprenticeship officials. . . ." Such a reflection of thought and concern for good sound training programs is gratifying to organized labor.

"Many vocational-school graduates come to industry with a highly inflated idea of their own worth . . . when they are actually only ready to begin learning skills that will prove useful . . . to industry."

### Local Problems

It may be well to look briefly at local training problems. There is no reason for a community to subsidize training for specific manufacturing concerns. This does not mean to imply that vocational schools should be indifferent to the particular needs of industry in their area. Certainly the vocational-education people in a community whose principal industrial activity is air-frame construction would tend to specialize in this field. However, they should not do so at the expense of the students' interests. Their ability to adapt themselves to meet changing conditions and their capacity to become skilled workmen in other areas of industry must be recognized.

It is only by turning out students equipped to become well-rounded craftsmen after they have had an opportunity to work in industry that we will meet the manpower requirements of our rapidly changing industrial system or give the individual his proper place in American industry.

There has been much talk and discussion of the shortage of scientists and engineers. To develop on paper a satellite or intercontinental ballistic missile and then not have skilled machinists trained to produce one is a problem we cannot brush aside.

To summarize: First, we should steer our youth toward a broad outlook and with a basic understanding of the nature of the metalworking industry as a whole; second, we should establish curriculums in our vocational schools that prepare our youth for the process of on-the-job learning which will develop in them a receptive attitude when they enter the trade; and, third, we should place more emphasis on developing a sense of dignity and pride in good craftsmanship so that more bright young minds will want to secure training in this great and important industry.

Organized labor has offered, and is still willing, to contribute more fully in many ways for more effective vocational education. The opportunity, when presented, to be on an advisory committee or other form of school endeavor will be met with a hopeful participation, and we ask that vocational directors and instructors give us an opportunity to assist in promoting good training. ★

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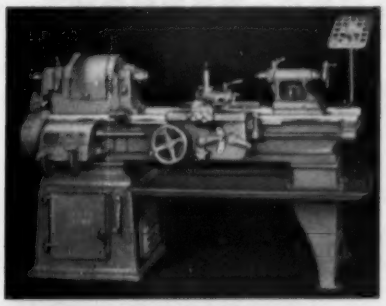

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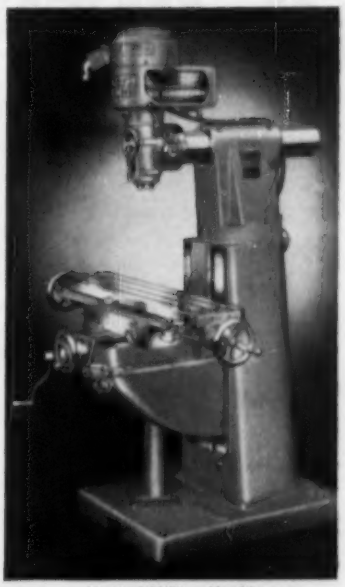

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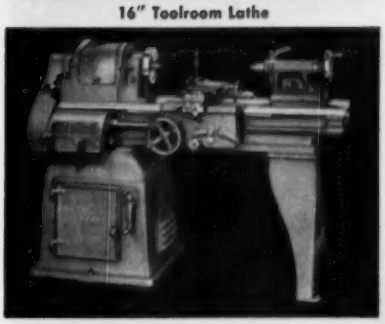

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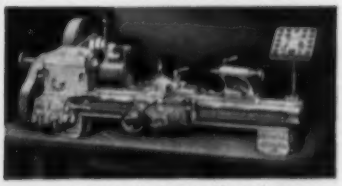

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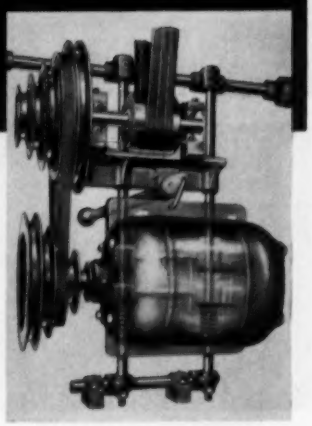

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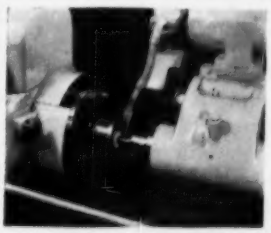

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New skills will be needed for tomorrow's world

# Labor Looks at Metalwork Training

*By Edward F. Carlough*

General Secretary-Treasurer, Sheet Metal Workers' International Association, Washington, D.C.

BETTER and more training is a basic ingredient to our expanding economy. This is essential not only in the field of sheetmetal fabrication, but in practically every aspect of industrial endeavor.

What are the problems which have particular significance to the sheetmetal industry and industrial education?

"Sheetmetal work" in its broadest phase covers a wide area of industrial construction and fabrication—all the way from installing ducts in an apartment house, air conditioning a factory, building an airplane, to making components for guided missiles. Within the metal-trades industries, there are well defined areas of jurisdiction of work. The boilermaker trades, for example, take heavy gage work; the ironworker takes another type of heavy structural work; the machinist works on airplane components; and the sheetmetal worker has as his jurisdiction sheetmetal of tengage measure or lighter in construction and fabrication. It is to this latter category that I address my primary observations on the sheetmetal industry and industrial education.

We are in an age of metals. New metals and new methods are coming increasingly to the attention of builders and manufacturers. And along with these metals are coming the plastics, many of which can be worked in the same fashion as metal is worked.

## A Growing Field

As the sheetmetal worker looks at the present economy he sees a growing field of use and usefulness for his skills. The advent of automation is bringing the needs for new control units, new cabinet work of metal, housing, etc.

Air conditioning is no longer a luxury. Department stores and other business establishments to which the public goes now must have air conditioning or feel the sharp impact of competitive establishments providing comfort for the customer. Air conditioning is also an essential to productive efficiency in offices, plants, warehouses, laboratories. We have hardly scratched the industrial surface in air conditioning as we look at the tremendous frontier of new construction ahead and of the growing requirements for remodeling and rehabilitation of older buildings.

New interest in home, office, and factory design and decoration is bringing a greater consciousness of the utility and beauty of various metal forms. These bring new challenges in metal design and fabrication.

Economists tell us that we are in for a boom in the service industries—food, stores, dry cleaning, sales, and distribution of all sorts. As these distribution units grow in volume and occupy an increasingly large share of our manpower, we will need more and more facilities—all the way from refrigerators to lockers, storage units, air conditioning, dust collectors, etc.

The area of national defense production is one which hardly needs comment. Sheetmetal workers are doing many jobs in the nation's shipyards, public and private. Some of our most skilled journeymen are coppersmiths and metalsmiths in navy yards working on everything from hairsprings to rocket cones.

Overriding practically every observation indicated heretofore is the fact that we are in a fantastic population boom. As new families are formed in the 1960's, we are going to need more of everything from houses to stores to schools to hotels, motels, etc. To serve this booming population and all its needs, we will need many skills and in the skills and talents needed, sheetmetal workers will play an important role.

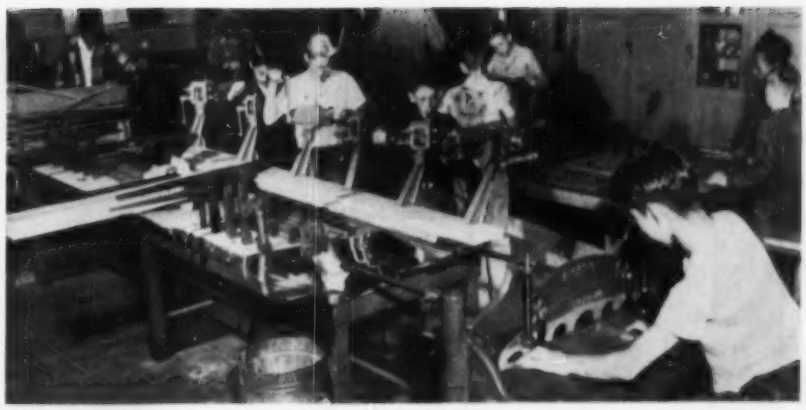
A young man in metalworking should learn as quickly as practicable the various metals with which he works as well as their characteristics plus how he can fashion, shape, and fabricate them.

New and almost fabulous needs are just around the corner and no temporary economic setbacks will ultimately deter us from the challenges of these needs. What do we do about them? Secretary of Labor James P. Mitchell recently told a convention of metal tradesmen that new skills and trades in the metal field will be critically needed for tomorrow's world. How do we fulfill these needs?

The metal trades are working in close cooperation with the Department of Labor through its Apprenticeship Service. Most of the trade unions in the metalworking field are proud of their apprenticeship programs. We certainly are. We have found that the joint apprenticeship committees are proving useful in many ways. These committees include employer and union members and almost invariably instructors in industrial education in the local vocational, high, or specialized schools.

We owe a great deal to these dedicated instructors who for years have been carrying forward the work of teaching and training in the shops and classrooms of our schools as an integral part of the sheetmetal-worker's education.

What specifically can we suggest as we look at the growing needs of the metal industry? What can we tell our young people who are about to select a trade which will be their life's work?



A knowledge of the tools of the trade is one of the basic elements in teaching metalworking classes.

### Basic Lessons

In the first place, instructors can make a real contribution by the simple job of orientation about the place of the craftsman. We too often hear today that the appreciation of skills, and use of skills, too, are being lost in the machine-age shuffle of labor-saving devices. There can never be a substitute for the skilled craftsman who has the knowledge and appreciation of his craft, his tools, and his job. This observation may sound a bit sentimental, but it is based on hard facts and realistic needs of our times.

Second, young men should learn about metals, their properties, their place in fabrication, and their limitations as well as potentialities. Since the metal itself is the working basis of the trade, the least the young man can learn as quickly as practicable are the various metals with which he works and the characteristics of those metals.

Third, a knowledge of the tools of the trade is basic. It should hardly seem necessary to mention these points, but until they are mastered, other considerations remain secondary.

Fourth, orientation in safe working habits should be developed. If the young man, whether in a shop class in school or as an apprentice in a sheetmetal shop, learns safe working and clean "shop housekeeping" habits, he will have achieved something which will be valuable throughout his working career.

The foregoing are all basic. The extent to which they are learned depends on the skill and ability of the instructor to get these simple, but basic, lessons across. An inspired instructor can have a profound impact on a young man's career if he does his teaching well in these fields, which are matters by no means in the nature of industry "frills."

### Particular Needs

Now for the particulars. We hear a great deal these days about the use of mathematics and its place in the world tomorrow. The place of math today—and yesterday—as well as tomorrow, is a lesson well learned by every journeyman worthy of his craft.

Of particular need is a well grounded knowledge of various aspects of measurement, including plane and solid geometry and triangulation. The application of these areas of mathematical science to the trade is important—how to transfer problems to well developed solutions in the forms of sketches and hence to blueprints and to patterns.

The path from idea to practical pattern is not short, nor is it easy. Sound and thorough instruction is necessary to ground the student or trainee. Combining math and sketching abilities will take the trainee a long way toward his objective.

The application of the pattern to the metal whether it be the design of a duct or a component for a lab table or stainless steel kitchen equipment takes care and skill. Complexities of design for defense items, atomic energy installations, new automation needs—all require advanced skills.

In the application of skills the workman must know his metal, how it acts and reacts, how to fashion, shape, and fabricate it. He must not only know how to make sketches and designs, but he must be able to translate these prints into production.

Our industrial-education teachers with whom we have liaison in connection with our apprenticeship programs are doing fine jobs. On this both the employer and the union man agree. The Sheet Metal Workers' International Association in cooperation with the Sheet Metal Contractors' National Association has been conducting a national apprenticeship contest annually for the last several years. As part of this contest, honors and prizes are offered. We believe that as an industry, we are making a real contribution to the needed skills pool of the nation.

Our official magazine publishes patterns and design and technical information as do the trade magazines of the industry. And I might add that the young man in the sheetmetal field might well become aware of the literature of his trade—not only the basic textbooks which are required, but specialized magazines which can be helpful to him as he advances up the economic ladder.

One final word: The young man who is well trained, conscientious, and ambitious has a great opportunity ahead. He has a chance for advanced journeyman training. Our union is emphasizing more and more the usefulness of post-journeyman training and refresher courses. These are useful and, in fact, essential, if the journeyman is going to progress from the workbench to the front office where he can become part of management. In his quest for success, if it includes a management post, he must not overlook any single step of industrial education along the way. The path may seem long, and at times rough, but it can also be exceptionally satisfying and rewarding. ★

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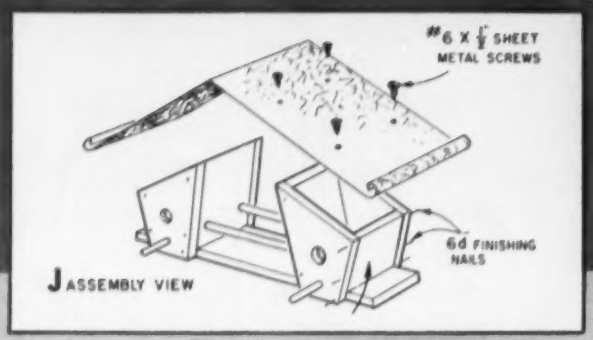
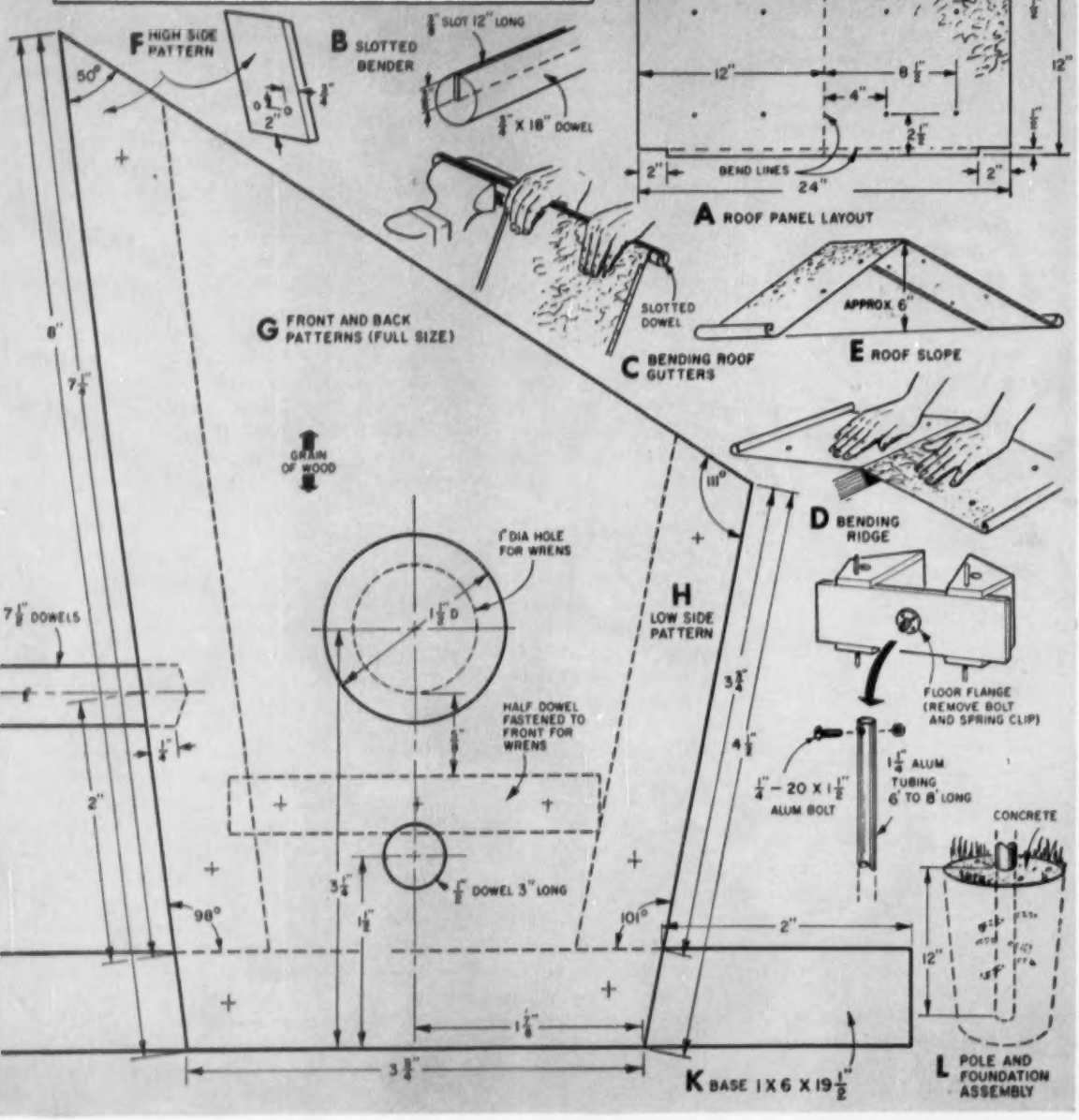


J ASSEMBLY VIEW



## MATERIALS LIST—DUPLEX BIRD HOUSE WITH BREEZEWAY

1 Pc. 24" x 12" DIYA Leather Grain Sheet Aluminum
1 Pc. 1¼" O.D. Aluminum Tubing 6' long
1 1¼" Aluminum Floor Flange
1 Pkg. #8 x ¾" Aluminum Wood Screws
1 7' Piece 1" x 6" Redwood
1 ½" x 36" Hardwood Dowel Rod
1 ¾" x 18" Wood Dowel Rod
1 Pkg. #6 x ½" Aluminum Sheet Metal Screws
1 Pkg. ¼—20 x 1½" Aluminum Bolts and Nuts
24 6d Finishing Nails
Suitable Redwood Finish (Spar Varnish, etc.)

### Construction Procedure

**1** Begin by cutting a piece of leather grained embossed aluminum sheet to 12" x 24" size; then cut out the ½" x 2" corners (Fig. A). Bend the ½" flanges on each side over the edge of your work bench and flatten.

**2** Cut a ⅜" slot in a ¾" dowel approximately 18" long (Fig. B). Hold the dowel in a vise, slip end of roof into slot and roll it around the dowel to form the gutter (Fig. C).

**3** Locate and drill eight ⅛" holes in the roof for sheet metal screws that fasten the roof to the top edge of each bird house. Then bend roof along center line to the proper pitch (Figs. D and E).

**4** Lay out the various sides on the redwood and cut them to shape (Figs. F, G and H). Drill the holes for the perch and the house opening in the two fronts before assembling the house. Tilt your table saw to the proper angle for making the individual cuts on house sides. Also, drill two ½" holes (¼" deep) in each of the large sides. Assemble the sides of the house and insert the 7½" dowels between houses before fastening the house to the base (Fig. K).

**5** After assembling the house except for the roof, it may be finished with a redwood finish or Spar varnish; then install the roof when dry (Fig. J).

**6** Remove bolt and spring clip from floor flange and fit flange into end of tubing. Drill ¼" hole through tubing and flange for ¼" x 1½" aluminum bolt. This allows house to be removed for cleaning. Attach flange to base of bird house and tubing to flange.

**7** Drill several holes in the base of the tubing for nails or wire (Fig. L). Dig a 12" deep hole about 6" in diameter; fill the hole with concrete. Insert the lower end of the tubing including the nails or wire for anchors and your duplex is ready for occupancy.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Sputnik destroyed complacency about education

# Labor Looks at Woodworking Education

*By Peter Terzick*

Editor, *The Carpenter*, Official journal of the United Brotherhood of Carpenters and Joiners of America, Indianapolis, Indiana

THE blast that propelled Sputnik into outer space reverberated throughout the classrooms of America. There was no actual shock wave, of course; but the unexpected success of Russian scientists in a field where much of our energies were concentrated produced a jolt that well may shake our entire educational system to its foundations. Any complacency that may have existed regarding the invincibility of our school system disappeared into the stratosphere with Sputnik.

Our whole educational program—from kindergarten through graduate school—is due for long, hard scrutiny with an unbiased eye. The archaic, the purely ornamental, the cumbersome, and the unproductive elements in American education can be considered to be on their way out.

Fortunately apprenticeship training and industrial education generally are pretty free of folderol and fancy fripperies. Generally speaking, they stick pretty close to the theory that nothing teaches quite so effectively as doing.

This is the oldest kind of education there is. It was in vogue when the pyramids were built and it will probably be in use long after they have crumbled to dust. All professions use it to greater or lesser degrees—medicine, law, accounting, etc. It may be called internship or something else, but essentially it is nothing more or less than apprenticeship training.

So, of all the facets of education, apprenticeship training may require the least overhauling to make it equal to the challenge the last half of the 20th Century will make on it. However, I am convinced that the importance of industrial training will increase spectacularly in the years ahead.

The need for skilled workers is expanding constantly. The President's commission to study education beyond the high school estimates that in the next 20 years the demand for skilled workers will increase by about 40 percent while the demand for unskilled workers will drop by 27 percent.

But this does not tell the entire story either. As technological advances grow more complicated, the skill needs of mechanics are bound to grow accordingly. The need for first-class men will grow greater year by year, for it is an incontrovertible fact that half a dozen second-rate men cannot take the place of a truly top-notch one. Clearly the emphasis in coming decades is going to be on competence.

"Industrial education and apprenticeship training, generally speaking, stick pretty close to the theory that nothing teaches quite so effectively as doing. This is the oldest kind of education there is."

"The need for skilled workers is expanding constantly. . . . It is clear that the emphasis in the coming decades is going to be on competence."

## Musclepower on the Way Out

Musclepower is going the way of the buggy whip and the dodo bird. Nothing brought this home more forcefully than a concrete demolition job recently finished at Schenectady, N.Y.

Four-foot-thick concrete walls had to be removed in an area where blasting was impossible. With sledge hammers or even jack hammers the job would have taken months and months. But it was finished in a few weeks with a powder lance—a long, slim piece of pipe fitted with a handle in which iron and aluminum powder and oxygen are mixed. The mixture is forced down the pipe and ignited. Particles of burning iron and aluminum powder bombard the surface being cut and generate enough heat to melt concrete. The four-foot walls were neatly sliced into 18-ton sections which a crane removed handily.

If handling a powder lance is not a skilled trade today, it will be eventually, once the technique is perfected. This gives the men who have been breaking concrete for years with musclepower the choice of training to become skilled lance handlers or seeking work elsewhere.

This, of course, is oversimplification, pure and simple, but the basic premise is completely valid. Thousands on thousands of men (including many whose

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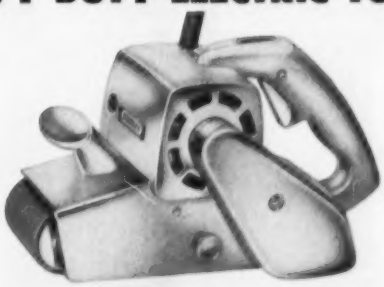

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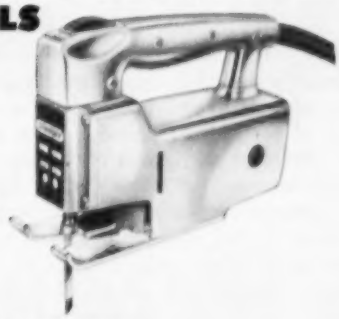

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"In addition to training youngsters coming up, our schools must be prepared to give new training to adults whose skills have been rendered meaningless by the advances of technological change."

original skills may become obsolete) will have to be retrained annually if American industry is to keep moving forward at a pace we have come to expect.

### New Training for Adults

This is a field where industrial education must be prepared to take up a lot of slack that results from inadequate education during normal school years. Men who for financial reasons (or even lack of motivation) failed to take all the advantage they could of the educational opportunities that lay before them as youngsters must be given a chance to make up their deficiencies. There will also be many men who need to be retrained because their old trades become useless before the advances of technological change.

So, in addition to training youngsters coming up, our schools must be prepared to give new training to adults whose skills have been rendered meaningless by the march of progress. The notion that learning is a process somehow or other exclusively connected with youth must be eradicated, for learning actually begins at birth and ends with death. Sputnik served notice that the nation cannot afford to deny any man the opportunity to develop his potential, be he 15 or 55.

In the light of all these developments, the role of the industrial-arts instructor, in the age of Sputnik and automation and atomic energy, assumes new importance. His influence becomes greater and, therefore, his responsibilities become greater, too.

In apprenticeship-training programs jointly administered by management and labor, training has achieved a relatively satisfactory degree of efficiency. Most such programs do a competent job of turning out well-rounded mechanics. In some areas, of course, the apprenticeship-training programs are much more efficient than they are in others. A good deal seems to depend on the degree of dedication that exists among the men responsible for the program. Where members of the joint committee are enthusiastic and generous with their time, the program is always effective. Where committee members take their responsibilities lightly, the program can begin to sag in short order.

The United Brotherhood of Carpenters has invested a great deal of time, money, and effort in the promotion of effective apprenticeship training. Over the past decade, the United Brotherhood has developed a master program of standards, complete with original textbooks written by a special apprenticeship committee of experts. This program is being followed verbatim in many localities. In other areas it serves as the basis for adaptations to localized conditions. In either event, the caliber of training is high where the standards prescribed by the Carpenters' programs are maintained faithfully.

### The Greatest Stumbling Block

From my limited observations, I am

"The United Brotherhood of Carpenters has invested time, money, and effort in the promotion of effective apprenticeship training. The caliber of training is high where the standards prescribed are maintained." Here an apprentice, under the supervision of a journeyman, plumbs a door jamb.

Mr. C. E. Bryan, Industrial Arts Teacher at Proviso High School, Maywood, Illinois, says, "Since those students who do not end up as mechanics will still have a need for 'tool know-how' in their homes, I believe the use of portable power tools as well as other types of tools should be taught."

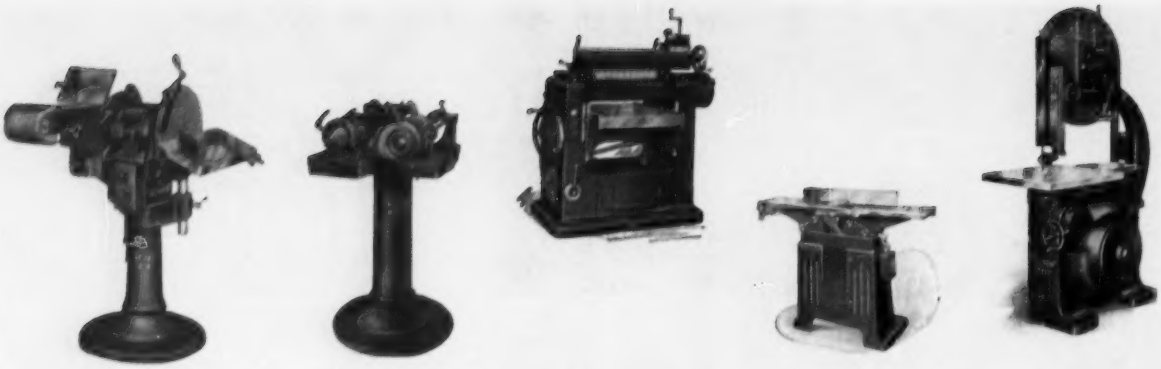
# Make "shop" useful for a lifetime...teach SKILMANSHIP!

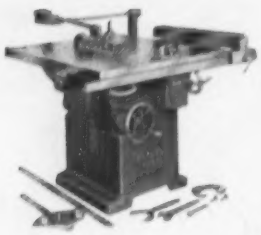
A new trend is starting in "shop" curriculum: Teach portable as well as hand and stationary power tools. Many homeowners have adopted a "do-it-yourself" program to save money. Portable power tools help them save hours of tedious work. The young men of today will be the "do-it-yourself" group tomorrow. They will appreciate the Skilmanship and safety you taught them in school, and the value of quality tools—SKIL sanders, routers, planes, drills, saws. (*Tools shown: Model 857 SKILSAW, 297 Router, 805 Belt Sander, 75 Drill.*)

SKIL

Made only by SKIL Corporation, manufacturer of famous SKIL and SKILSAW products, 5033 Elston Avenue, Chicago 30, Illinois.

**EQUIP YOUR SHOP WITH SKIL PORTABLE TOOLS**

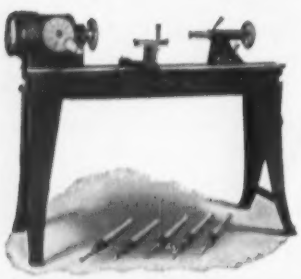




# Demand for thorough training calls for OLIVER machines

Today's need for sound basic vocational training of students is satisfied only by excellent instruction plus sturdy woodworking machines. Your students learn most on the machines used by industry.

Oliver machines are built to endure years of rugged service. Efforts of instructors are made easier and most effective. Furthermore, Oliver machines are safest to use!



Your students will find Oliver machines can be set up quickly and accurately. Self-locking devices keep the machines in perfect adjustment.

In nearly 2400 vocational shops instructors agree that Oliver machines give more and finer service. The machines shown here are but a few of a complete line to meet the demand for thorough training.

***Oliver equipment for vocational shops . . .***

| | | | |
|---|---|---|---|
| Band Saws | Saw Benches | Tenoner | Surfacers |
| Mortisers | Cut-off Saws | Jointers | Oilstone Tool Grinders |
| Shapers | Woodturning Lathes | Jig Saw | Disk and Belt Sanders |
| Borers | Metal Spinning Lathes | Wood Trimmers | Benches and Vises |

**Let us send you bulletins on machines that interest you!**

OLIVER SINCE 1890

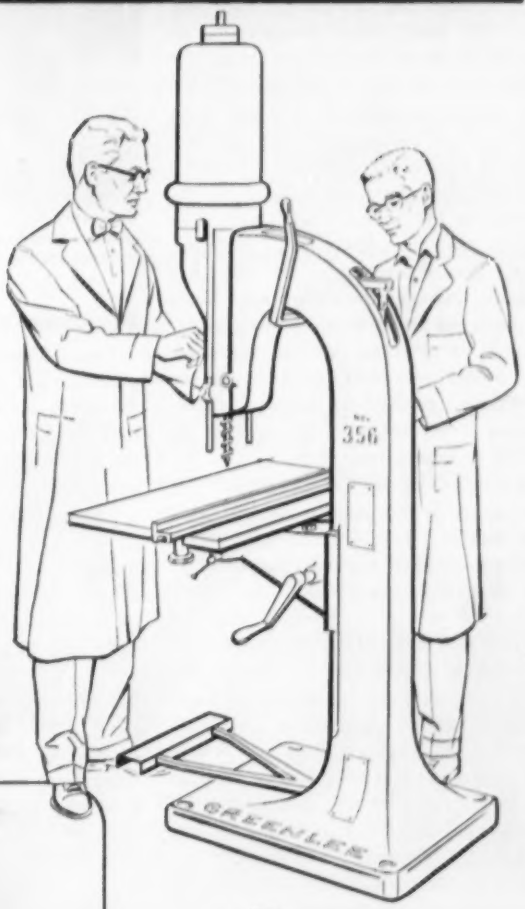
**OLIVER MACHINERY COMPANY**
**Grand Rapids 2, Michigan**

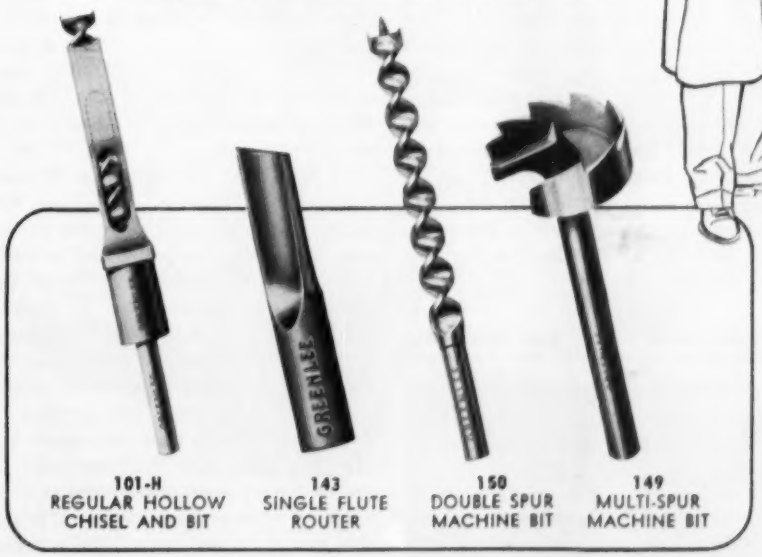
TOOLS FOR CRAFTSMEN
GREENLEE

# Precision Tools Aid Craftsmanship

## GREENLEE TOOLS stay sharp . . . help students produce better wood products!

Enjoy the pride of craftsmanship your students obtain from industry-proven Greenlee tools for boring, routing and mortising. Reduce department costs with fewer tool replacements. Realize the peace of mind that comes from a safer school shop using sharp, safe Greenlee tools. Greenlee production quality tools are made of tough alloy steels that hold a safer, cleaner cutting edge . . . bring out the best possible performance from your machines. They are correctly designed for extra quality, superior workmanship. See your Greenlee jobber or write today.




101-H REGULAR HOLLOW CHISEL AND BIT
143 SINGLE FLUTE ROUTER
150 DOUBLE SPUR MACHINE BIT
149 MULTI-SPUR MACHINE BIT

*WRITE FOR CATALOG 34-M*

You'll find it contains valuable information about all Greenlee tools, and a wood screw boring chart that tells what drill bits to use for drilling wood screw holes of various sizes.

WOODWORKING MACHINERY MANUFACTURERS' ASSOCIATION

**GREENLEE TOOL CO.**

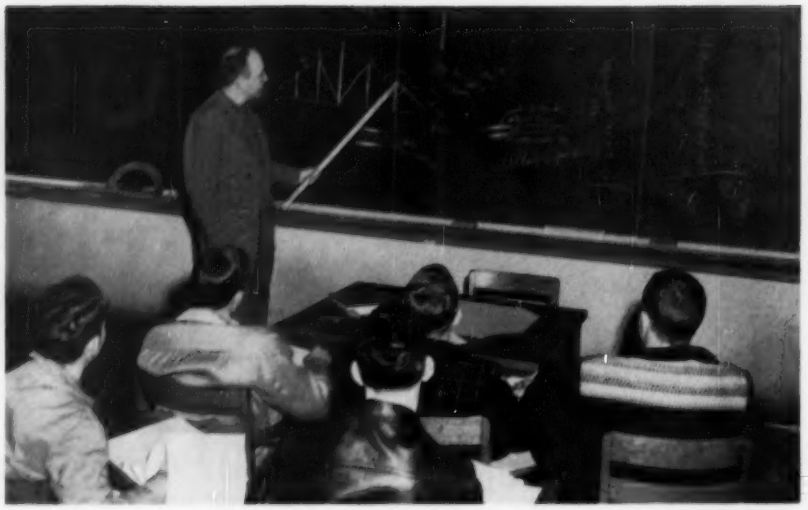
Division of Greenlee Bros. & Co.
2484 HERBERT AVENUE
ROCKFORD, ILLINOIS

inclined to believe that related training constitutes the greatest stumbling block to top-notch apprenticeship training. Boys only a year or two removed from the long, academic grind through grade school and high school often are allergic to further classroom instruction, even if they get paid for attending class. The on-the-job training they eat up; but the book work, the math, the geometry, and other skull work they pretty generally shun. It often takes no little prodding to keep the book work progressing as rapidly as the on-the-job education.

Yet the growing complexity of materials and techniques will demand more and more grounding in theory and less and less in manual application. Entirely new building materials may be forthcoming in five or ten years. New techniques may be devised for erecting them. The changes may be vast. But whatever changes the future may bring to materials or techniques, the fundamentals of geometry will be the same then as they are today or were a thousand years ago. And the design and erection of structures will still involve the use of geometry and math.

All this adds up to one thing: The instructors in the public-school systems who handle related-training classes for apprentices have a great responsibility for presenting the material as clearly and as interestingly as possible to arouse the curiosity of the trainee, and, insofar as possible, inspire him to want to learn.

The same thing holds pretty much true for "shop" education at both high-school and grade-school levels. Where the instructor is enthusiatic as well as qualified, some of the enthusiasm inevitably rubs off on the youngsters. They find the shop period a challenge.



"The instructors in the school systems who handle related-training classes for apprentices have a great responsibility for presenting the material as clearly and as interestingly as possible so as to arouse the curiosity of the trainee and, insofar as possible, inspire him to want to learn."

### Suggestions for Teachers

This, of course, is no simple thing to achieve. But it is worth striving for. It may be presumptuous for a layman to make suggestions to professionals, but the following observations may merit consideration:

High priority should be given techniques that develop pride in good workmanship even at the grade-school level. Projects should not be so easy that they offer no sense of challenge to the student nor so hard that they discourage him before he gets going. With students of different degrees of interest, ability, and perseverence indiscriminately mixed up in a class, choosing projects to fit all categories is no cinch, but the more progress that can be made in this direction the better will be the training absorbed by the boys.

Students should be exposed to trade publications—especially those put out by trade associations—to give them the "feel" of being part of a great industry that contributes to the health, safety, and happiness of the nation.

Since most students who put their shop training to use after graduation will encounter a union as soon as they go to work, some briefing relative to the history, aims, and objectives of unions could profitably be given in school.

An occasional lecture from a man from "the industry" explaining new technological advances in the industry might stimulate interest. (Ditto from a union representative.)

At best these are somewhat abstract suggestions. However, I believe the great need is to instill in future craftsmen the sense of urgency that actually exists in all trades. The need for thoroughly competent men is rapidly catching up with the nation. One major corporation has relieved its shortage of engineers by uncovering some really competent craftsmen. Now, instead of developing an idea clear through to the blueprint stage, the engineer calls in one of these true craftsmen and says:

"Here is the problem: We want to put this gadget in this space. Make it this way and we think it will work."

The engineer then forgets the project, knowing full well that the idea is being followed through to its logical conclusion by a man who knows what he is doing.

As technology increases, this sort of relationship between theoretical men and practical men is bound to increase. And both men will need the best possible training. Sputnik demands that they get it. ★

High priority in schools should be given techniques that develop pride in good workmanship. Projects should not be so easy that they offer no challenge nor so hard that they discourage."

# COLUMBIAN WOODWORKERS' VISES MEET EVERY NEED . . .

Completely redesigned, Columbian Woodworkers' Vises offer you a real opportunity to write your own specifications—exactly as you want them!

You have your choice of 2 sizes—specify (7) for 4 x 7" jaws with 9" opening or (10) for 4 x 10" jaws with 12" opening. Also your choice of 2 different continuous screw mechanisms—specify (R) for Rapid Acting "Power-Slide" Nut, or (C) for Solid Nut type. You may select between (P) Plain or (D) Dog type front jaws. You may specify (W) Seasoned Hardwood Handle, (T) Tubular Steel Handle, or (S) Adjustable Steel Handle.

For example, No. 7CDW specifies 4 x 7" jaws, 9" opening, solid nut mechanism, dog type front jaw, seasoned hardwood handle—old catalog No. 5CD.

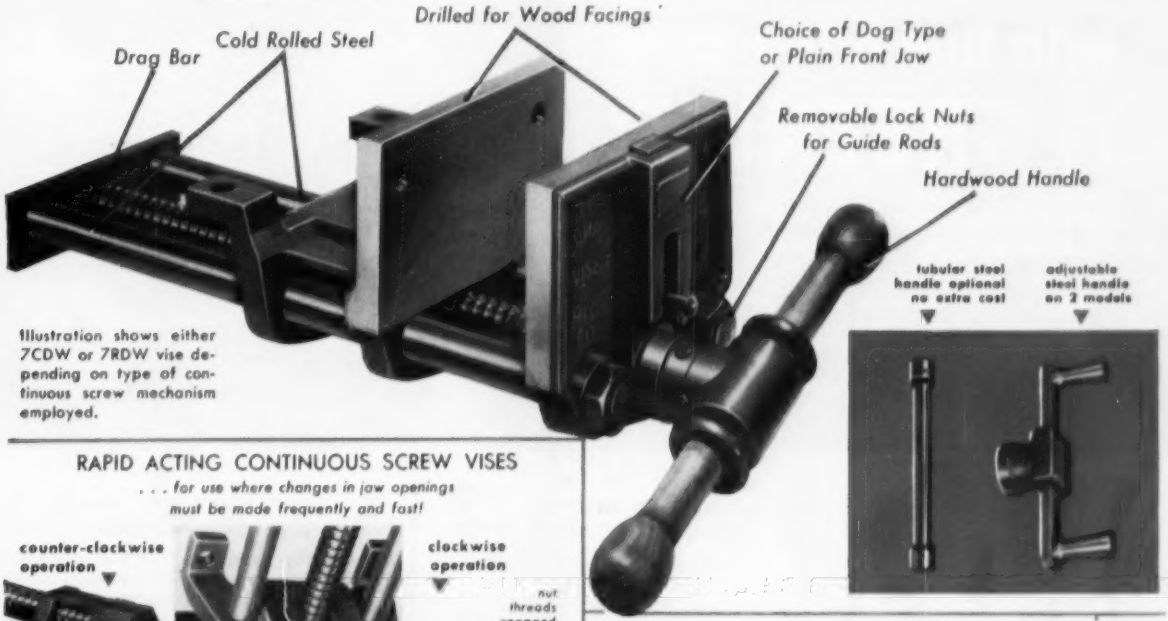
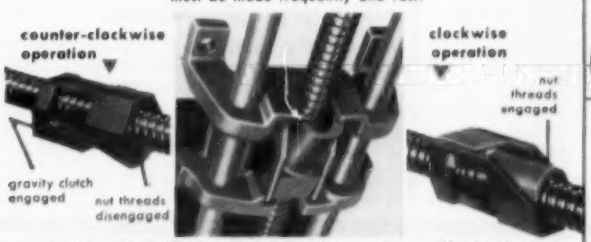

Drilled for Wood Facings
Drag Bar
Cold Rolled Steel
Choice of Dog Type or Plain Front Jaw
Removable Lock Nuts for Guide Rods
Hardwood Handle
tubular steel handle optional no extra cost
adjustable steel handle on 2 models

Illustration shows either 7CDW or 7RDW vise depending on type of continuous screw mechanism employed.

## RAPID ACTING CONTINUOUS SCREW VISES

*. . . for use where changes in jaw openings must be made frequently and fast!*

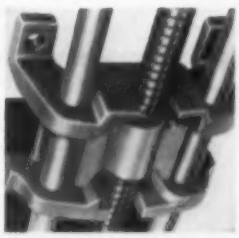


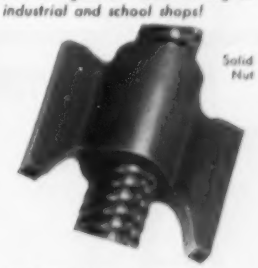

**Rapid Acting "Power-Slide" Continuous Screw Mechanism**

Key to superior operation is exclusive "Power-Slide" mechanism. This incorporates a gravity friction clutch which assures positive operation (no springs) and automatically compensates for wear. Counter-clockwise operation of screw disengages mechanism, facilitating "free sliding" adjustment of jaw opening. Clockwise operation of screw engages full 180° half-nut, producing continuous inward jaw movement and high pressure holding without slippage.

## SOLID NUT CONTINUOUS SCREW VISES

*. . . for general woodworking in industrial and school shops!*





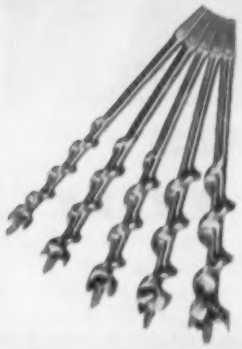

▲ **Solid Nut Continuous Screw Mechanism**

Heavy steel screw is made with double lead, fast running thread to provide maximum speed of operation. Solid Nut assures long, repair-free life.

2 models of Solid Nut Continuous Screw Vises are made with special Adjustable Steel Handles for extra fast operation.

**COLUMBIAN Vises**

The Columbian Vise & Mfg. Co.
CLEVELAND 4, OHIO

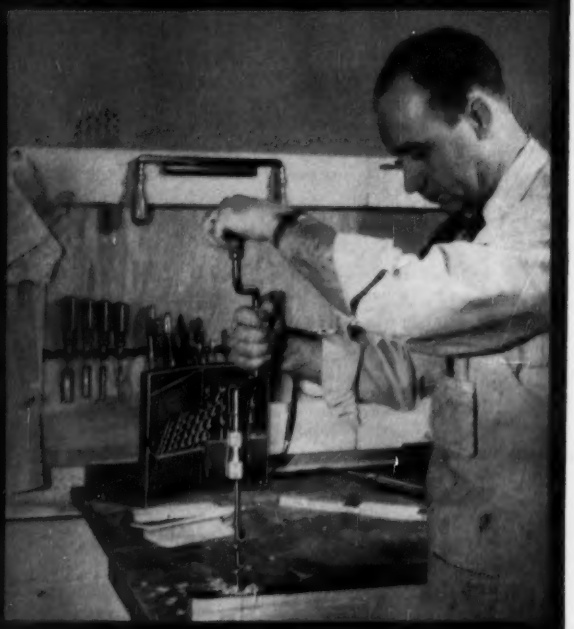


**GREENLEE 22 SOLID-CENTER AUGER BITS**

Made with utmost care to assure free, easy boring and fast chip clearance. Solid-center design for extra strength, smooth operation. Accurately sized, perfect cutting edges. "Plastic-Sealed" to reach you factory-sharp. Can be purchased singly or in handy bench sets and steel boxes as shown at right (also in plastic rolls).

# Better Shopwork with fine hand tools by GREENLEE

Good workmanship comes easily with GREENLEE tools. All are carefully formed and finished for accuracy and correct cutting edges and are properly heat-treated for long life. They are made by craftsmen for craftsmen.

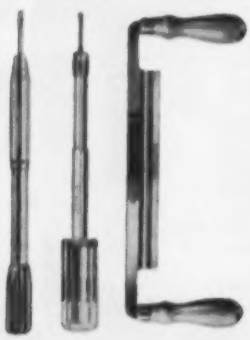


**CHISELS, GOUGES, TURNING TOOLS**

Various types of tang butt, socket butt and firmer chisels with durable green plastic or hickory handles. Outside and inside bevel socket gouges. Short and full-length turning tools.

**EXPANSIVE BITS, DRILLS, ELECTRIC-DRILL BITS**

Fast, easy-boring expansive bits with positive chip clearance. Two styles: Setfast with quick adjusting-locking feature, and Plain type. Wood-boring brace drills and solid-center electric-drill bits in various sizes.



**SPIRAL SCREW DRIVERS, PUSH DRILLS, DRAWKNIVES**

Free-running, fast action GREENLEE spiral screw drivers are available in two models: Enclosed Spiral for extra safety and grit-free operation, and Open Spiral. Automatic push drills are smooth operating with automatic spring return . . . handle holds eight drill points. GREENLEE drawknives are light in weight and have sturdy, rigid blades for accurate work.

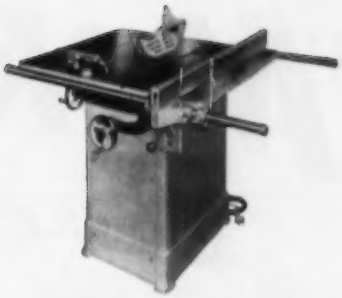
The GREENLEE line also includes many other time-saving tools for students and shop workers: Bit Extensions, Electricians' Bits, Tubing Benders, Radio Chassis Punches, and many more. Write for free catalog No. 35-H.

TOOLS FOR CRAFTSMEN

**GREENLEE**

**GREENLEE TOOL CO.**

2044 Twelfth St., Rockford, Illinois



# COMPARE

## DURO *New Design* POWER TOOLS

for Quality!
for Features!
for PRICE!

**See why DURO offers the greatest power tool values!**

More and more school shops throughout the country are adopting Duro Power Tools as standard equipment in their workshops. Students find they can produce better projects in less time—in safety. Instructors enjoy the built-in ruggedness, the extra capacity and precision each unit offers. Superintendents and board members appreciate the lifetime quality and budget price which makes them practical additions to long range planning.

Whatever your needs may be—whether it's a single unit addition or a complete workshop, it will pay you to compare Duro before you buy. When you analyze Duro Power Tool features, sizes, specifications and operating advantages, with any of the other leading brands on the market—you will quickly see why Duro offers more for your money!

The Duro line of precision power tools include circular saws, drill presses, band saws, scroll saws, belt and disc sanders, lathes, jointers, routers plus a full line of accessories. Write for the facts—today.

**Send for FREE power tool catalog, Comparison Chart, and Shop Plan Guide!**

All 3 are free. You will get a graphic picture of Duro superiority where it counts most—in size, capacity, features and PRICE! Write today.

**DURO METAL PRODUCTS COMPANY**
2689 N. Kildare Ave. • Chicago, Illinois

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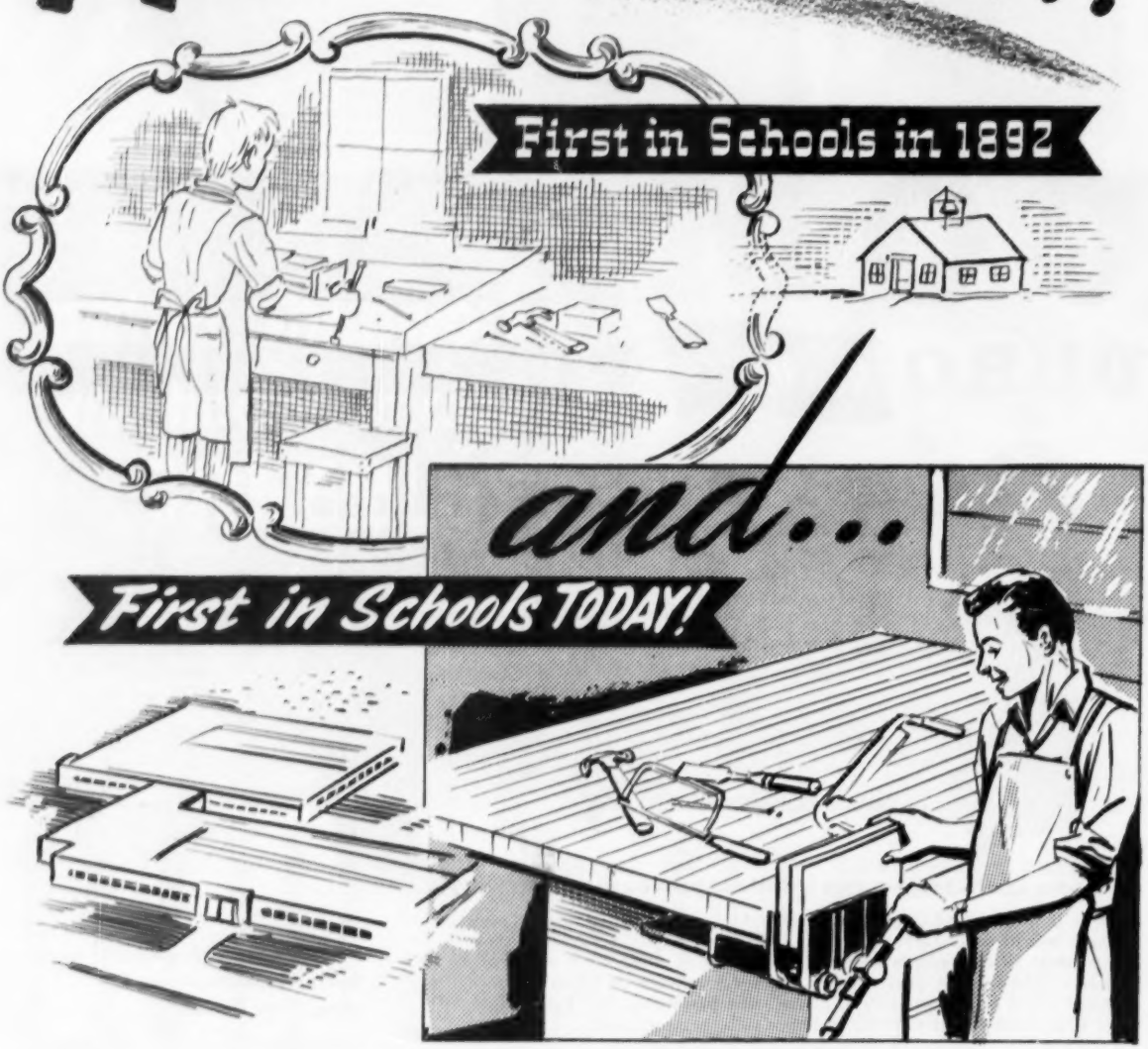
2689 N. KILDARE AVENUE • CHICAGO, ILLINOIS
Gentlemen: Please send me "3 for FREE" your Power Tool Catalog, Comparison Chart and Shop Plan Guide.

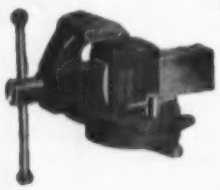
Name_____
School_____
Address_____
City and State_____

# MORGAN VISES...

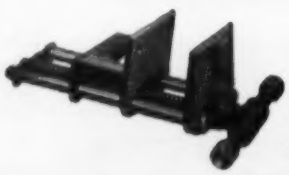



The acceptability of Morgan Vises in school shops since 1892 is due to one thing—***no compromise with quality.*** There is a complete choice of sizes and types with Morgan's Woodworkers' (with exclusive tubular steel handle), Machinists', Pipe and Combination Pipe Vises. Unconditional guarantee. ***Send for complete catalog.***

CONTINUOUS SCREW WOODWORKING VISE



MACHINISTS' BENCH
Solid jaw and swivel base

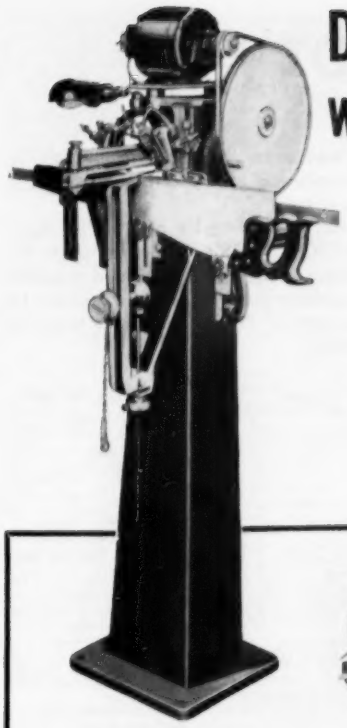


18-A DUAL PURPOSE WOODWORKING VISE

**MORGAN VISE COMPANY**

112 North Jefferson Street
CHICAGO 12, ILLINOIS

# Double saw life–train your students better with FOLEY SAW FILING EQUIPMENT



**EXCELLENT STUDENT TRAINING**

Train your students to use Foley machines. They will do better work with Foley sharpened saws. Foley equipment is safe to operate and is widely used by hundreds of schools, colleges, industries, Army, Navy, Air Force, etc.

**FASTER SAW RECONDITIONING**

You can sharpen 4 to 6 hand saws per hour with these three Foley Automatic power machines—Retoother, Saw Filer, Setter.

**VOCATIONAL REHABILITATION**

Foley Saw Sharpening Machines have proven their value for making physically handicapped persons self-supporting in their own business. Write us for full details.

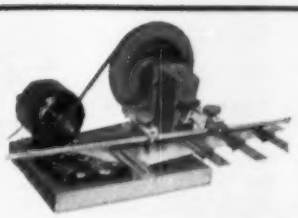
**30-DAY FREE TRIAL**

Any Foley machine may be installed on 30-day FREE TRIAL. Write today for detailed information.

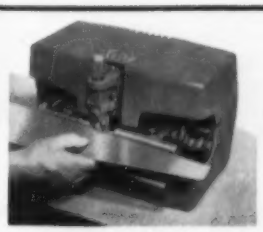
**FOLEY MANUFACTURING CO.**
**3316 N.E. 5th St. Minneapolis 18, Minn.**



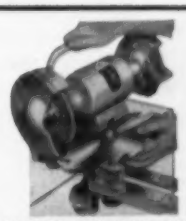
**FOLEY SAW FILER**
Files hand, band and cross-cut circular saws with machine accuracy. The saw is clamped in carrier which feeds it through all 3 machines for retoothing, filing, setting.



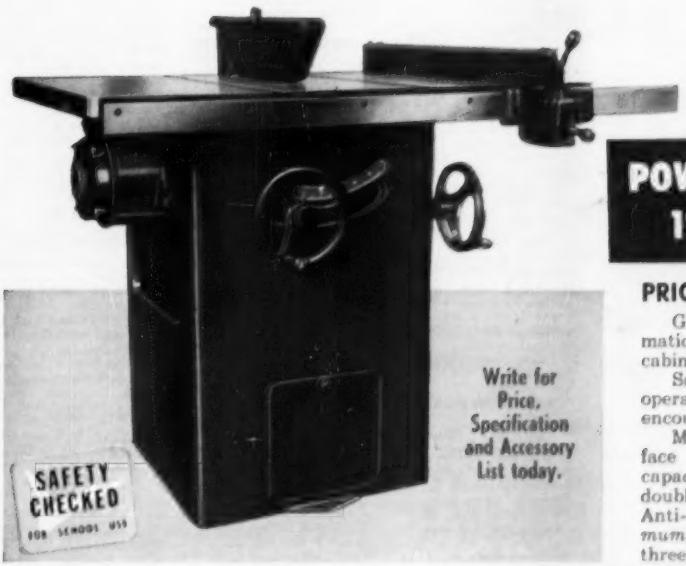
**FOLEY RETOOTHER**
Cuts new teeth in old saws (either straight or crowned edge) in one run through machine.



**FOLEY SETTER**
For both hand and band saws. Sets teeth on both sides in ONE run with perfect machine accuracy.



**NEW FOLEY GRINDER**
Low cost Foley 314 Grinder sharpens circular saws up to 44" diam.; also dado heads, rotary power lawn mower blades, scissors, sharp edged tools. Sands, buffs, polishes.




Write for Price, Specification and Accessory List today.

# Safe, Sure, Solid

## POWERMATIC'S NEW MODEL 70 12" TILTING ARBOR SAW

**PRICED TO FIT YOUR SCHOOL BUDGET**

Get the arbor saw the factories use! See why Powermatic is preferred by hundreds of production plants, cabinet, school and millwork shops all over the nation.

Safety-engineered for trainee protection! Simple operation makes training easier! Precision accuracy encourages perfection!

Machined 30x40" rib-reinforced table keeps true surface . . . standard T-slot extensions give *extra* cut-off capacity. Accurately-machined cast iron fence has double support, locks front and back in any position. Anti-kickback pawls on guard and splitter assures *maximum safety*. Saw tilts full 45°, 1 to 3 HP, single or three-phase motor.

Over a Quarter-Century of Building Precision Power Machines

**ARBOR SAWS • BAND SAWS • LATHES**
**PLANERS • JOINTERS • TENONERS • DRILL PRESSES**
**HOLLOW-CHISEL & CHAIN MORTISERS**

**DEALERS IN PRINCIPAL CITIES**
**MAIL COUPON FOR FULL INFORMATION NOW!**

MAIL THIS COUPON NOW!
Rush full details on Powermatic's ☐ Arbor Saws ☐ Full line

DEPT. 7
Company_____
Address_____
City & State_____

**POWERMATIC MACHINE COMPANY**
McMinnville • Tennessee

# Suppliers Directory

**For the 15th successive year, SCHOOL SHOP offers to its readers this extensive and up-to-date guide to sources of equipment and supplies needed in shop work. Listed below are the manufacturers and distributors of more than 190 classifications of products, ranging from Abrasive Paper, Cloth to Wrenches, Torque.**

**This year the sources of supplies are listed first under the various classifications. Following this, starting on page 62, is the alphabetical list of all the firms included in the first section. To use the directory, look under the classification first to find the suppliers of the item needed, then use the alphabetical list for the addresses of the firms.**

**The Suppliers Directory has proved to be one of the most popular and helpful of SCHOOL SHOP's special features. Be sure to keep this issue handy, so that when you need supplies and equipment during the coming year you will know where to write for catalogs and information. Please be sure to mention SCHOOL SHOP when writing.**

### ABRASIVE PAPER, CLOTH
Balko Tool & Machine Co.
Brodhead-Garrett Co.
M. L. Campbell Co.
D. W. Cope Plastics
Craftsman Supply House
Craftsman Wood Service Co.
DeWalt, Inc.
General Finishes Sales & Service
Giles & Kendall Co.
Grieger's Inc.
C. R. Hill Co.
Howard & Smith, Inc.
Patterson Bros.
Plastic Products Co.
Sax Bros., Inc.

### ABRASIVE STONES, WHEELS
Balko Tool & Machine Co.
DeWalt, Inc.
Grieger's Inc.
Howard & Smith, Inc.
Frank Mittermeier
Patterson Bros.
Skil Corp.
Stewart Clay Co., Inc.

### AIR COMPRESSORS
Brunner Mfg. Co.
M. L. Campbell Co.
Craftools, Inc.
Howard & Smith, Inc.
Patterson Bros.
Stewart Clay Co., Inc.

### AIRCRAFT TOOLS
Severance Tool Industries, Inc.

### AIRPLANE MODELS, SUPPLIES
Craft Service

### AUDIO AND VISUAL AIDS
Allied Radio Corp.
Aluminum Co. of America
Charles Bessler Co.
Better Light Better Sight Bureau
Charles Bruning Co., Inc.
Delco-Remy Division
Linde Co.
McGraw-Hill Book Co.
United World Films, Inc.
Walker-Turner Division

### AUTOMOTIVE ELECTRICAL ASSEMBLIES
Brodhead-Garrett Co.
Delco-Remy Division

### AUTOMOTIVE SHOP EQPT.
**(See also Hand Tools, Mechanics)**
Balko Tool & Machine Co.
Barrett Eqpt. Co.
Blackhawk Mfg. Co.
Brodhead-Garrett Co.
National School Supply
National System of Garage Ventilation, Inc.
Parent Metal Products
Patterson Brothers
Ruemelin Mfg. Co.
Tolerton Co.
J. H. Williams & Co.

### BENCHES, SHOP METAL OR WOOD
**(See also Shop Furniture)**
American Type Founders
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Craftools, Inc.
Freeman Supply Co.
Howard & Smith, Inc.
Parent Metal Prods. Inc.
Patterson Bros.
E. H. Sheldon Eqpt. Co.
South Bend Lathe Works
Standard Pressed Steel Co.
Tolerton Co.

### BENDING MACHINES
Balko Tool & Machine Co.
Berkroy Products Co.
Brodhead-Garrett Co.
Dreis & Krump Mfg. Co.
Imperial Brass Mfg. Co.
O'Neil-Irwin Mfg. Co.
Patterson Bros.
Peck, Stow & Wilcox Co.
J. A. Richards Co.
W. Whitney Stueck, Inc.
Swayne, Robinson & Co.

### BITS, WOODWORKING
Brodhead-Garrett Co.
Burstein-Applebee Co.
Chicago-Latrobe
Albert Constantine & Son, Inc.
Craftsman Wood Service
Delta Power Tool Division
DeWalt, Inc.
"Dowl-It" Co
Freeman Supply Co.
Greenlee Tool Co.
Howard & Smith, Inc.
Irwin Auger Bit Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools
Whitman & Barnes

### BLOW TORCHES
Brodhead-Garrett Co.
Howard & Smith, Inc.
Linde Co.
Patterson Bros.

### BLUEPRINTING EQPT.
**(See also Drafting Eqpt.)**
Charles Bruning Co., Inc.
Keuffel & Esser Co.
Modern School Supplies
Peck and Harvey
Frederick Post Co.
Stacor Equipment Co.

### BOOKBINDING EQPT. & SUPPLIES
Challenge Machinery Co.
Craftools, Inc.
G. A. Pratt Co.

### BOOKS
**(See Publishers)**

### BRACES, BITS
**(See also Hand Tools, Woodworking)**
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Howard & Smith, Inc.
Millers Falls Co.
Patterson Bros.
Stanley Tools

### BRAZERS, BAND SAW BLADE
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Huther Bros. Saw Mfg. Co.
Oliver Machinery Co.

### BUFFING LATHES
Baldor Electric Co.
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Craftools, Inc.
Divine Bros. Co.
Patterson Bros.

### BUFFING WHEELS & COMPOUNDS
Balko Tool & Machine Co.
Brodhead-Garrett Co.
D. W. Cope Plastics
Craftools, Inc.
Delta Power Tool Div.
DeWalt, Inc.
Divine Bros. Co.
Grieger's Inc.
C. R. Hill Co.
Jewelry Craft Supply
Machine Shop Project Service
Patterson Bros.
Plastic Parts & Sales
Plastic Products Co.
Sax Bros., Inc.

### BURRS
Balko Tool & Machine Co.
D. W. Cope Plastics
House of Plastics
Plastic Parts & Sales
Plastic Products Co.
Severance Tool Industries, Inc.

### CABINETS, TOOL AND STORAGE
Balko Tool & Machine Co.
Charles Bruning Co., Inc.
Brodhead-Garrett Co.
Freeman Supply Co.
Howard & Smith, Inc.
Montgomery & Co., Inc.
Parent Metal Prods.
Patterson Bros.
E. H. Sheldon Eqpt. Co.
Standard Pressed Steel Co.
Tolerton Co.

### CALIPERS
Alvin & Co., Inc.
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe
Albert Constantine & Son, Inc.
Craftsman Wood Service
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
Modern School Supplies
Patterson Bros. Co.
Geo. Scherr Co., Inc.
L. S. Starrett Co.
Stewart Clay Co., Inc.

### CANS, OIL, GASOLINE AND SAFETY
Eagle Mfg. Co.
Patterson Bros.

### CASTINGS—MACHINE SHOP PROJECTS
Casting Specialties Co.
House of Plastics
Lewis Machine Tool Co.
Machine Shop Project Service

### CERAMIC EQUIPMENT
Bergen Arts & Crafts
Brodhead-Garrett Co.
Craftools, Inc.
Howard & Smith
J. C. Larson Co., Inc.
Patterson Bros.
Sax Brothers, Inc.
School Prods. Co.
Seeley's Ceramic Service
Stewart Clay Co., Inc.
Tapping Studio Supply
Western Materials Co.

### CERAMIC KILNS
Bergen Arts & Crafts
Craftools, Inc.
Duo-Kiln
Electric Hotpack Co., Inc.
C. R. Hill Co.
Sax Bros., Inc.
School Products Co.
Seeley's Ceramic Service
Stewart Clay Co., Inc.
Tapping Studio Supply Co.
Western Materials Co.

### CERAMIC SUPPLIES
Bergen Arts & Crafts
Brodhead-Garrett Co.
Craftools, Inc.
J. C. Larson & Co., Inc.
Sax Brothers, Inc.
School Products Co.
Seeley's Ceramic Service
Stewart Clay Co., Inc.
Tapping Studio Supply
Tolerton Co.

### CHISELS, METALWORKING
Balko Tool & Machine Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Howard & Smith, Inc.
Patterson Bros.
Stanley Tools
J. H. Williams & Co.

### CHISELS, WOODWORKING
**(See also Hand Tools, Woodworking)**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Albert Constantine & Son, Inc.
Craft Service
Craftsman Wood Service
Delta Power Tool Div.
DeWalt, Inc.
Freeman Supply Co.
Greenlee Tool Co.
Howard & Smith, Inc.
Millers Falls Co.
Frank Mittermeier
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
Sax Brothers, Inc.
Stanley Tools
Woodcraft Supply Co.

### CHUCKS, LATHE & MAGNETIC
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Delta Power Tool Div.
Oneida Machine Tool Corp.
Patterson Bros.
Walker-Turner Division

### CLAMPS, "C"
Adjustable Clamp Co.
Armstrong Brothers Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Tool Co.
Craftsman Wood Service
Howard & Smith, Inc.
Machine Shop Project Service
Patterson Bros.
Wetzler Clamp Co.
J. H. Williams & Co.
Wilton Tool Mfg. Co.

### CLAMPS, METALWORKING
Adjustable Clamp Co.
Armstrong Bros. Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Tool Co.
Howard & Smith, Inc.
Montgomery & Co., Inc.
Patterson Bros.
L. S. Starrett Co.
Upholstery Supply Co.
Wetzler Clamp Co.
J. H. Williams & Co.
Wilton Tool Mfg. Co.

### CLAMPS, WOODWORKING
Adjustable Clamp Co
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Craftsman Wood Service
DeWalt Inc.
Freeman Supply Co.
Howard & Smith, Inc.
Patterson Bros.
Porter & Dietsch, Inc.
Wetzler Clamp Co.
J. H. Williams & Co.
Wilton Tool Mfg. Co.

### CLEANERS, FILE
Brodhead-Garrett Co.
Cincinnati Tool Co.
Patterson Bros.

### CLOCK MOVEMENTS
Brodhead-Garrett Co.
D. W. Cope Plastics
Gilbert & Miller, Inc.
Immerman & Sons
Plastic Products Co.
School Products Co.

### COUNTERSINKS
Brodhead-Garrett Co.
Chicago-Latrobe
Greenlee Tool Co.
Patterson Bros.
Severance Tool Industries, Inc.
Stanley Tools
Whitman & Barnes

### CRAFT SUPPLIES
Balko Tool & Machine Co.
Bergen Arts & Crafts
Brodhead-Garrett Co.
Cadillac Plastic & Chemical Co.
D. W. Cope Plastics
Copper Shop
Craftools, Inc.
Craft Service
Craftsman Supply House
Dearborn Leather Co.
DonJer Products Co.
Gearon Co.
Gilbert & Miller, Inc.
Giles & Kendall Co.
Grieger's, Inc.
C. R. Hill Co.
House of Plastics
Kit Kraft
J. C. Larson Co.
Metal Goods Corp.
Metal Supply, Inc.
Minnesota Woodworkers Supply
Modern School Supplies
Patterson Bros.
Plastic Parts & Sales Co.
Plastic Products Co.
Rad Devil Tools
Sax Brothers, Inc.
School Products Co.
Stewart Clay Co., Inc.
Upholstery Supply Co.
Webcraft, Inc.
X-acto, Inc.

### CUTTERS, PAPER
Brodhead-Garrett Co.
Challenge Machinery Co.
Craftools, Inc.
Patterson Bros.
Pioneer-Toledo Corp.
Sax Bros., Inc.

### CUTTING TOOLS, MACHINE SHOP
Armstrong Brothers Tool Co.
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Chicago-Latrobe
Cincinnati Tool Co.
DeWalt, Inc.
Howard & Smith, Inc.
Huther Bros. Saw Mfg. Co.
Mico Instrument Co.
Patterson Bros.
Severance Tool Ind., Inc.
South Bend Lathe Works
Whitman & Barnes
J. H. Williams & Co.

### DESK SET FITTINGS
Gilbert & Miller, Inc.
House of Plastics
School Products Co.

### DIVIDERS
Alvin & Co., Inc.
Balko Tool & Machine Co.
Berger Scientific Supplies
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Burstein-Applebee Co.
Albert Constantine & Son, Inc.
Keuffel & Esser
Lufkin Rule Co.
Modern School Supplies
Patterson Bros.
Peck, Stow & Wilcox Co.
George Scherr Co., Inc.
Stanley Tools
L. S. Starrett Co.

### DIVIDING HEADS
Balko Tool & Machine Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Lewis Machine Tool Co.
Montgomery & Co., Inc.
Patterson Bros.
George Scherr Co., Inc.
U.S. Burke Machine Tool Co.

### DOWEL DRILL GUIDE
Brodhead-Garrett Co.
Craftsman Wood Service
"Dowl-It" Co.
Patterson Bros.

### DOWELS
Brodhead-Garrett Co.
Cotton-Hanlon, Inc.
Craft Service
Craftsman Wood Service
"Dowl-It" Co.
T. A. Foley Lumber Co.
Patterson Bros.
Frank Paxton Lumber Co.

### DRAFTING EQPT.
Alvin & Co., Inc.
Berger Scientific Supplies, Inc.
Brodhead-Garrett Co.
Charles Bruning Co., Inc.
Burstein-Applebee Co.
Gramercy Guild Group, Inc.
Howard & Smith
Keuffel & Esser
Mayline Co.

Modern School Supplies
Patterson Bros.
**Frederick Post Co.**
**Stacor Equipment Co.**
Tolerton Co.
V & E Manufacturing Co.

**DRAFTING FURNITURE**
Ajusto Eqpt. Co.
Alvin & Co., Inc.
Brodhead-Garrett Co.
Charles Bruning Co., Inc.
Garrett Tubular Prods., Inc.
Keuffel & Esser Co.
Mayline Co.
Modern School Supplies
Parent Metal Products, Inc.
Patterson Bros.
Frederick Post Co.
Stacor Equipment Co.
Standard Pressed Steel Co.
Tolerton Co.

**DRAFTING SUPPLIES**
Alvin & Co., Inc.
**Berger Scientific Supplies, Inc.**
**Brodhead-Garrett Co.**
Charles Bruning Co., Inc.
C-Thru Ruler Co.
Dolgorukov Mfg. Co.
Eberhard Faber Pencil Co.
Gramercy Guild Group, Inc.
Higgins Ink Co., Inc.
Ray B. Hobein
Keuffel & Esser
Mayline Mfg. Co.
Modern School Supplies
Patterson Bros.
**Frederick Post Co.**
School Products Co.
**Stacor Equipment Co.**

**DRILL PRESSES**
Balko Tool & Machine Co.
**Boice-Crane Co.**
Brodhead-Garrett Co.
**Cincinnati Lathe & Tool Co.**
Clausing Div., Atlas Press
**Delta Power Tool Division**, DeWalt, Inc.
**Duro Metal Products Co.**
Freeman Supply Co.
**Howard & Smith, Inc.**
Lewis Machine Tool Co.
Mico Instrument Co.
Millers Falls Co.
Patterson Bros.
J. A. Richards Co.
South Bend Lathe Works
Walker-Turner Div.

**DRILLS, HAND**
**Brodhead-Garrett Co.**
Chicago-Latrobe
**Howard & Smith, Inc.**
**Millers Falls Co.**
Patterson Bros.
Sax Bros., Inc.
Stanley Tools

**DRILLS, PAPER**
Challenge Machinery Co.
Patterson Bros.
**Pioneer-Toledo Corp.**

**DRILLS, PLASTICS CARVING**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
D. W. Cope Plastics
Craftsman Supply House
House of Plastics
Plastic Products Co.

**DRILLS, PORTABLE ELECTRIC**
**(See also Portable Electric Tools)**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
D. W. Cope Plastics
House of Plastics
**Howard & Smith, Inc.**
**Millers Falls Co.**
Patterson Bros.
**Plastic Products Co.**
Skil Corp.
**Stanley Electric Tools**
Sunbeam Corp.

**DRILLS, TWIST**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
Chicago-Latrobe
"Dowl-It" Co.
**Howard & Smith, Inc.**
Millers Falls Co.
Patterson Bros.
**Plastic Products Co.**
**Whitman & Barnes**

**DUPLICATING MACHINES**
American Type Founders
Heyer Corp.

**DUST COLLECTORS**
American Air Filter Co.
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Craftools, Inc.
Delta Power Tool
Kindt-Collins Co.
Ohio Blow Pipe Co.
Patterson Bros.
Woodcraft Supply Co.

**ELECTRIC EQUIPMENT AND SUPPLIES**
**(See also Radio Eqpt.)**
Brodhead-Garrett Co.
Burstein-Applebee
Electric Hotpack Co., Inc.
**Gearon Co.**
National Wiring Bureau
**Ohmite Mfg. Co.**
**Patterson Brothers**
Seco Mfg. Co.
Stanley Electric Tools
Tolerton Co.
Universal Scientific Co., Inc.

**ELECTRIC MOTORS**
**(See Motors)**

**ELECTRONIC EQPT.**
**(See also Radio Eqpt.)**
Allied Radio Corp.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Burstein-Applebee
Electric Hotpack Co., Inc.
Electronic Instrument Co
Electronic Kits Supply Co.
**Heath Company**
**Ohmite Mfg. Co.**
Science Electronics Corp.
Seco Mfg. Co.
Sprague Prods. Co.
Triple Cities R.C. Supply Co.
Universal Scientific Co., Inc.

**ENAMELING, EQUIPMENT AND SUPPLIES**
Bergen Arts & Crafts
Brodhead-Garrett Co.
The Copper Shop
Craftools, Inc.
Craft Service
Craftsman Supply House
Dearborn Leather Co.
Electric Hotpack Co., Inc.
Grieger's Inc.
C. R. Hill Co.
J. C. Larson Co.
Sax Brothers, Inc.
School Products Co.
Seeley's Ceramic Service
Stewart Clay Co., Inc.
Tepping Studio Supply
Thomas C. Thompson Co.
Western Materials Co.

**ENAMELING KILNS**
Bergen Arts & Crafts
Craftools, Inc.
Craft Service
Craftsman Supply House
Dearborn Leather Co.
Duo-Kiln Mfg. Co.
Electric Hotpack Co., Inc.
Grieger's, Inc.
C. R. Hill Co.
Patterson Bros.
Sax Bros., Inc.
School Products Co.
Seeley's Ceramic Serv.
Stewart Clay Co., Inc.
Tepping Studio Supply Co.
Thos. C. Thompson Co.
Western Materials Co.

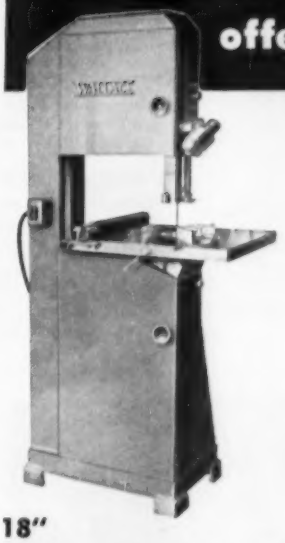
**ENGRAVING MACHINES**
George Scherr Co., Inc.

**EXTRACTORS, PIPE STUD, SCREW, TAP, DRILL**
Brodhead-Garrett Co.
Chicago-Latrobe
Montgomery & Co., Inc.
**Patterson Bros.**
Whitman & Barnes
J. H. Williams & Co.

**FIBERGLASS**
**(See Plastics)**

**FILERS, DIE**
Boice-Crane Co.


# Here are 5 good reasons why WALLACE Woodworking Machines offer *MORE for LESS!*

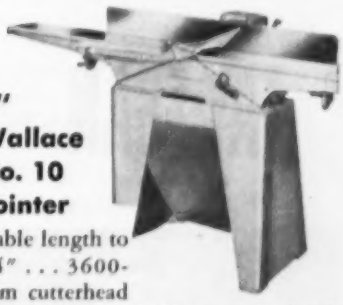


**18"**
**Wallace No. 56 Band Saw**

Cuts woods, plastics, metals—easily and quickly! Features 50 to 3800-fpm speeds . . . and exclusive blade guide adjustment from above. Takes standard rip fence and miter gauge—adjustable from −10° to 45°. All this in a heavy-duty, quality band saw—maximum safety at lowest price.

**Wallace No. 11 Universal Saw**

Makes any cut, ripping or cross cutting, on 4' x 8' plywood panel without special jigs or fixtures. Has ample table area in all directions . . . 24", 36" or 48" rip capacity . . . built-in drive unit. Cuts to 4" depth. Moderately priced — outstanding in speed and capacity!

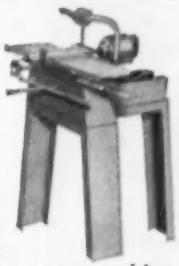


**8"**
**Wallace No. 10 Jointer**

Table length to 64" . . . 3600-rpm cutterhead direct drive—or 5200-rpm cutterhead speed gear drive . . . four 8" skew-set knives for smoothest shear cut. Roller bearings resist shock, eliminate cutterhead chatter.

**Wallace No. 55 Production Shaper**

Brings fast, flexible operation to all shaper jobs. Features 10,000 or 7200-rpm spindle speeds. Produces extra fine finish. Has ample table surface, positive non-slip drive and optionai spindles—1-piece or removable. Makes *any* cut with *any* cutter—and does it better!



**Wallace Routiser**

For joining cabinet and sash frames, rails and stiles, picture frame joints, chair rungs and legs, furniture frame parts and many, many other jobs. Can be arranged for mortise, tenon and boring work. A machine that's quick and easy to set up.

WRITE: J. D. WALLACE & CO., INC., WARSAW, IND.
UNION-WALLACE-INDIANA . . . A MANUFACTURING GROUP DEVOTED TO PRODUCING THE HIGHEST QUALITY WOODWORKING MACHINES.

J. D. WALLACE & COMPANY, INC. WARSAW INDIANA · SINCE 1918 ·

**J. D. WALLACE & COMPANY, INC.**

1056 N. Detroit St., Warsaw, Ind.

Sales Service Machine Tool Co.

**FILES, HAND**
Brodhead-Garrett Co.
Grieger's Inc.
C. R. Hill Co.
Howard & Smith, Inc.
Frank Mittermeier
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
Severance Tool Ind., Inc.
Skil Corp.

**FILES, ROTARY**
Balko Tool & Machine Co.
Frank Mittermeier
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
Severance Tool Ind., Inc.

**FILING MACHINES**
Boice-Crane Co.
Foley Mfg. Co.
Howard & Smith, Inc.

**FINDINGS, METAL**
Brodhead-Garrett Co.
Copper Shop
Craft Service
Grieger's Inc.
C. R. Hill Co.
House of Plastics
Jewelry Craft Supply
J. C. Larson Co.
School Products Co.

**FLEXIBLE SHAFT MACHINES**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
D. W. Cope Plastics
C. R. Hill Co.
House of Plastics
Patterson Bros.
Plastic Prods. Co.
Walker-Turner Div.

**FORGES**
Brodhead-Garrett Co.
McEnglevan Heat Treating & Mfg. Co.
Patterson Bros.
Sunbeam Corp.
Western Materials Co.

**FORGE TOOLS**
Brodhead-Garrett Co.
Howard & Smith, Inc.
Patterson Bros.
Stanley Tools

**FOUNDRY EQPT.**
Brodhead-Garrett Co.
Craftools, Inc.
DeWalt, Inc.
Freeman Supply Co.
Howard & Smith, Inc.
McEnglevan Heat Treating & Mfg. Co.
Patterson Bros.
Tolerton Co.
Western Materials Co.

**FURNACES, SHOP (Forge, Heat Treating, Melting)**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Howard & Smith, Inc.
McEnglevan Heat Treating & Mfg. Co.
Nolan Corp.
Patterson Bros.
Stewart Clay Co., Inc.
Sunbeam Corp.
western Materials Co.

**FURNITURE (See Shop Furniture)**

**GAGES, METALWORKING**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
Montgomery & Co., Inc.
Patterson Bros.
Geo. Scherr Co., Inc.
L. S. Starrett Co.

**GAGES, WOODWORKING**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Craftsman Wood Service
Freeman Supply Co.
Howard & Smith, Inc.
Lufkin Rule Co.
Magna-Set Co.
Millers Falls Co.
Patterson Bros.
George Scherr Co. Inc.
Stanley Tools
L. S. Starrett Co.

**GLAZIERS' TOOLS**
Stanley Tools

**GLUE POTS**
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Howard & Smith, Inc.
Patterson Bros.
Woodcraft Supply Co.

**GLUES, CEMENTS**
Bergen Arts & Crafts
Borden Co.
Brodhead-Garrett Co.
Charles Bruning Co., Inc.
Cadillac Plastic Co.
M. L. Campbell Co.
D. W. Cope Plastics
Craft Service
Craftsman Supply House
Craftsman Wood Service
Freeman Supply Co.
Giles & Kendall Co.
Higgins Ink Co.
House of Plastics
Howard & Smith, Inc.
Kindt-Collins Co.
J. C. Larson Co.
Minnesota Woodworkers Supply Co.
Modern School Supplies
Patterson Bros.
Frank Paxton Lumber Co.
Plastic Parts & Sales
Plastic Products Co.
Rogers Isinglass & Glue Co.

**GRINDERS, CENTERLESS**
Cincinnati Milling Machine Co.

**GRINDERS, PORTABLE ELECTRIC**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
Craftools, Inc.
Machine Shop Project Service
Millers Falls Co.
Patterson Bros.
Plastic Products
Skil Corp.
Stanley Electric Tools
Sunbeam Corp.

**GRINDERS, PRODUCTION, SURFACE**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe
Cincinnati Milling Machine Co.
Delta Power Tool Div.

**GRINDERS, TOOL (See also Grinders, Portable; Grinders, Toolpost)**
Baldor Electric Co.
Balko Tool & Machine Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe
Cincinnati Milling Machine Co.
Clausing Div., Atlas Press
Delta Power Tool Division
DeWalt, Inc.
Howard & Smith, Inc.
Mico Instrument Co.
Oliver Machinery Co.
Patterson Bros.
Skil Corp.
South Bend Lathe Works
Stanley Electric Tools
Walker-Turner Div.

**GRINDERS, TOOLPOST**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Patterson Bros.
South Bend Lathe Works

**GRINDING WHEELS**
Cincinnati Milling Machine Co.
Craftsman Wood Service Co.
Delta Power Tool Div.
Greiger's, Inc.
Machine Shop Project Service
Patterson Bros.
Skil Corp.
Stewart Clay Co., Inc.

**GUARDS, CIRCULAR SAW**
Balko Tool & Machine Co.
Boice-Crane Co.
Brett-Guard Co.
Delta Power Tool Div.
Patterson Bros.
Yates-American Machine Co.

**GUARDS, WOODWORKING MACHINERY**
Balko Tool & Machine Co.
Boice-Crane Co.
Brett-Guard Co.
Delta Power Tool Div.
J. A. Fay & Egan Co.
Patterson Bros.

**HACKSAWS, HAND (See also Hand Tools)**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Howard & Smith, Inc.
Millers Falls Co.
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
L. S. Starrett Co.

**HACKSAWS, POWER**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Howard & Smith, Inc.
Lewis Machine Tool Co.
Millers Falls Co.
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
Sales Service Machine Tool
L. S. Starrett Co.

**HAMMERS, METALWORKING**
Billings & Spencer Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
C. R. Hill Co.
Howard & Smith, Inc.
Patterson Bros.
Peck, Stow & Wilcox Co.
Sax Brothers Co.
Stanley Tools

**HAMMERS, WOODWORKING**
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service
Howard & Smith, Inc.
Millers Falls Co.
Patterson Bros.
Stanley Tools

**HAND TOOLS, MACHINE SHOP (See also Hand Tools, Mechanics)**
Armstrong Brothers Tool Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Burstein-Applebee Co.
Cincinnati Tool Co.
Freeman Supply Co.
Howard & Smith, Inc.
Lufkin Rule Co.
Millers Falls Co.
Montgomery & Co., Inc.
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
Geo. Scherr Co., Inc.
Stanley Tools
L. S. Starrett Co.
J. H. Williams & Co.

**HAND TOOLS, MECHANICS**
Armstrong Bros. Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Tool Co.
Albert Constantine & Son, Inc.
Duro Metal Products Co.
Howard & Smith, Inc.
Imperial Brass Mfg. Co.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
George Scherr Co., Inc.
Stanley Tools
L. S. Starrett Co.
J. H. Williams & Co.

**HAND TOOLS, WOODWORKING**
Brodhead-Garrett Co.
Cincinnati Tool Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service
Freeman Supply Co.
Greenlee Tool Co.
Howard & Smith, Inc.
Irwin Auger Bit Co.
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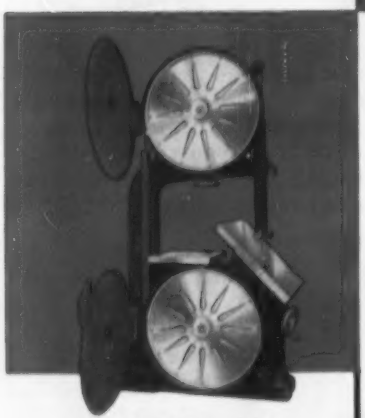

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Grieger's Inc.
Sax Bros., Inc.

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Delta Power Tool Division
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**R. K. LeBlond Machine Tool Co.**
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Patterson Bros.
**Sheldon Machine Co.**
**South Bend Lathe Works**

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Brodhead-Garrett Co.
Delta Power Tool Div.
**Oliver Machinery Co.**
Patterson Bros.
Sheldon Machine Co.
Yates-American Machine Co.

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Clausing Div., Atlas Press
Delta Power Tool Div.
Greenlee Tool Co.
**Howard & Smith Inc.**
**Logan Engineering Co.**
Sheldon Machine Co.
**South Bend Lathe Works**

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**Brodhead-Garrett Co.**
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**Duro Metal Products Co.**
Freeman Supply Co.
**Howard & Smith, Inc.**
**Oliver Machinery Corp.**
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**Brodhead-Garrett Co.**
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**Howard & Smith, Inc.**
**Logan Engineering Co.**
Montgomery & Co., Inc.
Patterson Bros.
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**Brodhead-Garrett Co.**
**Brown & Sharpe**
**Howard & Smith, Inc.**
**Lufkin Rule Co.**
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Geo. Scherr Co., Inc.
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Reynolds Metals
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DonJer Products Co.
R. K. LeBlond Machine Tool Co.
Logan Engineering Co.
Montgomery & Co., Inc.
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O'Neil-Irwin Mfg. Co.
Parent Metal Products, Inc.
Patterson Bros.
Peck Stow & Wilcox Co.
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Stanley Tools
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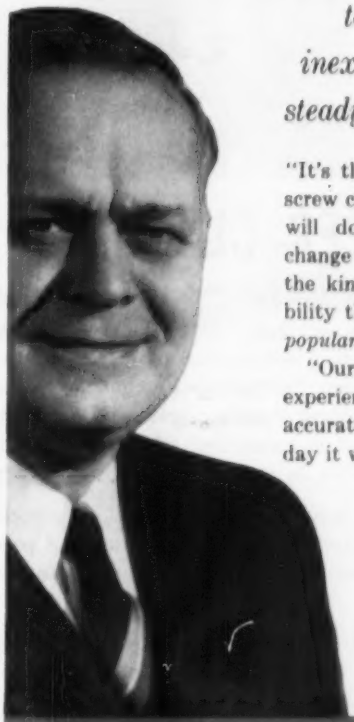
# "This lathe is a work horse... *Teaching the intricate skills of lathe metalworking to a shop full of impetuous, inexperienced youngsters takes steady nerves and sturdy lathes.*



"It's the kind of job this Logan 11" screw cutting lathe is built for. . . . It will do *more* things *well*, with no change in bearing adjustment. This is the kind of versatility and dependability that spells *low upkeep* and *high popularity* with educators!

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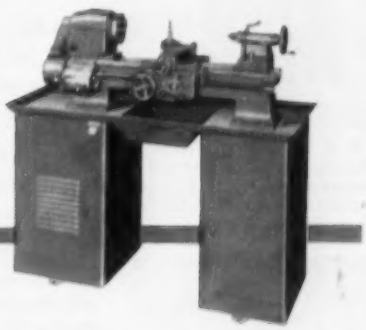

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Greenlee Tool Co.
Howard & Smith, Inc.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
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J. A. Fay & Egan Co.
Greenlee Tool Co.
Howard & Smith, Inc.
Lewis Machine Tool Co.
Millers Falls Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Parks Woodworking Machine Co.
Patterson Bros.
Powermatic Machine Co.
Walker-Turner Division
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Yates-American Machine Co.

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Cincinnati Tool Co.
Greenlee Tool Co.
Howard & Smith, Inc.
Machine Shop Project Service
Patterson Bros.
Peck, Stow & Wilcox Co.
Stanley Tools
J. H. Williams & Co.

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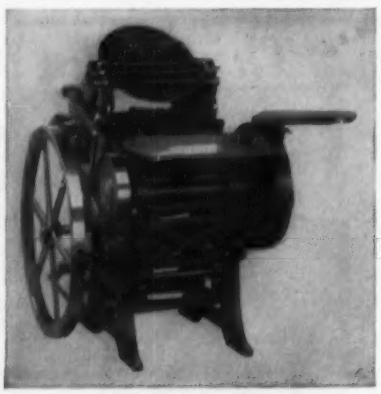

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Skil Corp.
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Patterson Bros.
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C-Thru Ruler Co.
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Gramercy Guild Group
**Howard & Smith, Inc.**
**Kauffel & Esser**
**Lufkin Rule Co.**
**Millers Falls Co.**
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H. K. Porter Co., Henry Disston Div.
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**Brodhead-Garrett Co.**
Burstein-Applebee Co.
M. L. Campbell Co.
Delta Power Tool Div.
**DeWalt, Inc.**
J. A. Fay & Egan Co.
Freeman Supply Co.
**Howard & Smith, Inc.**
Kindt-Collins Co.
**Millers Falls Co.**
**Oliver Machinery Co.**
**Parks Woodworking Machine Co.**
Patterson Bros.
**Red Devil Tools**
Skil Corp.
Stanley Electric Tools
Sunbeam Corp.
**Walker-Turner Division**
**Yates-American Machine Co.**

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Balko Tool & Machine Co.
**Brodhead-Garrett Co.**
Albert Constantine & Son, Inc.
**Craftsman Wood Service Co.**
Delta Power Tool Division
Heinemann Saw Corp.
**Howard & Smith, Inc.**
Huther Bros. Saw Mfg. Co.
**Millers Falls Co.**
Parks Woodworking Machine Co.
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
**L. S. Starrett Co.**
**Walker-Turner Division**
Wells Manufacturing Co.

**SAW BLADES, CIRCULAR**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
D. W. Cope Plastics
**Craftsman Wood Service**
**Delta Power Tool Division**
**DeWalt, Inc.**
Heinemann Saw Corp.
**Howard & Smith, Inc.**
Huther Bros. Saw Mfg. Co.
Millers Falls Co.
Patterson Bros.
Plastic Products Co.
H. K. Porter Co., Henry Disston Div.
Skil Corp.
Walker-Turner Division

**SAW BLADES, METAL CUTTING**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
**Delta Power Tool Division**
**DeWalt, Inc.**
Heinemann Saw Corp.
C. R. Hill Co.
Huther Bros. Saw Mfg. Co.
**Millers Falls Co.**
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
Sax Brothers, Inc.
Skil Corp.
**L. S. Starrett Co.**
**Walker-Turner Division**
**Wells Manufacturing Co.**

**SAW BLADES, SCROLL**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Craftsman Supply House
**Delta Power Tool Division**
DeWalt, Inc.
**Howard & Smith, Inc.**
Patterson Bros.
**Walker-Turner Division**

**SAW FILERS, AUTOMATIC**
Foley Mfg. Co.
**Howard & Smith, Inc.**
Huther Bros. Saw Mfg. Co.
Quick Way Saw Co.

**SAWS, HAND, WOODWORKING**
**Brodhead-Garrett Co.**
Albert Constantine & Son, Inc.
**Howard & Smith, Inc.**
**Millers Falls Co.**
Patterson Bros.
Woodcraft Supply Co.

**SAWS, JIG**
Balko Tool & Machine Co.
**Boice-Crane Co.**
Brodhead-Garrett Co.
Burstein-Applebee Co.
Clausing Div., Atlas Press Co.
Craft Service
Dalton Mfg. Co.
**Delta Power Tool Division**
**DeWalt, Inc.**
**Duro Metal Products Co.**
**Howard & Smith, Inc.**
**Millers Falls Co.**
**Oliver Machinery Co.**
Patterson Bros.
J. A. Richards Co.
Sax Bros., Inc.
School Products Co.
Skil Corp.
**Walker-Turner Division**

**SAWS, METALCUTTING, BAND**
Atlas Press Co.
Balko Tool & Machine Co.
**Boice-Crane Co.**
**Brodhead-Garrett Co.**
Brown & Sharpe Mfg. Co.
Burstein-Applebee Co.
**Delta Power Tool Division**
J. A. Fay & Egan Co.


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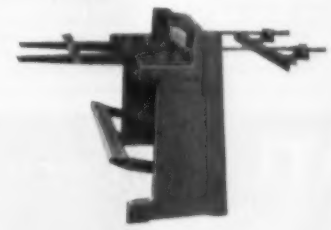
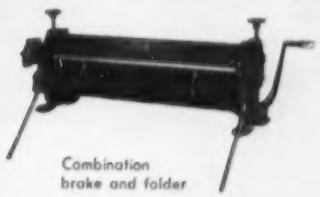
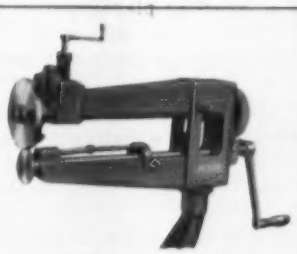

Foot squaring shear

Ring and circle shear

Slip roll forming machine

Adjustable bar folder


Combination brake and folder


Double seaming machine

Combination rotary machine

*also . . .*
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A complete line of machines and tools for Sheet Metal Fabrication.

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**Wells Manufacturing Co.**

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**Brodhead-Garrett Co.**
Burstein-Applebee Co.
DeWalt, Inc.
Freeman Supply Co.
House of Plastics
**Howard & Smith, Inc.**
**Millers Falls Co.**
Patterson Bros.
Skil Corp.
**Stanley Electric Tools**
Sunbeam Corp.

**SAWS, SCROLL, WOODWORKING**

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Balko Tool & Machine Co.
**Brodhead-Garrett Co.**
Albert Constantine & Son, Inc.
**Craftsman Wood Service Co.**
**Delta Power Tool Division**
DeWalt, Inc.
**Duro Metal Products Co.**
J. A. Fay & Egan Co.
Freeman Supply Co.
**Howard & Smith, Inc.**
Patterson Bros.
**Walker-Turner Division**

**SAWS, WOODWORKING, BAND**

Atlas Press Co.
Balko Tool & Machine Co.
**Boice-Crane Co.**
**Brodhead-Garrett Co.**
**Delta Power Tool Division**
DeWalt Inc.
**Duro Metal Products Co.**
J. A. Fay & Egan Co.
Freeman Supply Co.
**Howard & Smith, Inc.**
Lewis Machine Tool Co.
Northfield Foundry & Machine Co.
**Oliver Machinery Co.**
**Parks Woodworking Machine Co.**
Patterson Bros.
L. S. Starrett Co.
**Walker-Turner Division**
J. D. Wallace & Co., Inc.
Yates-American Machine Co.

**SAWS, WOODWORKING, CIRCULAR**

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Brodhead-Garrett Co.
**Delta Power Tool Division**
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**Duro Metal Products Co.**
Freeman Supply Co.
Greenlee Tool Co.
**Howard & Smith, Inc.**
Lewis Machine Tool Co.
Northfield Foundry & Machine Co.
**Parks Woodworking Machine Co.**
Patterson Bros.
Oliver Machinery Co.
J. A. Richards Co.
**Walker-Turner Division**
J. D. Wallace & Co., Inc.
Yates-American Machine Co.

**SCREWDRIVERS**

Balko Tool & Machine Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
Albert Constantine & Son, Inc.
Howard & Smith, Inc.
**Irwin Auger Bit Co.**
**Millers Falls Co.**
Patterson Bros.
Stanley Tools
J. H. Williams & Co.

**SCREWDRIVERS, PORTABLE ELECTRIC**

Balko Tool & Machine Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
**Millers Falls Co.**
Patterson Bros.
Oliver Machinery Co.
J. A. Richards Co.
**Walker-Turner Division**
J. D. Wallace & Co., Inc.
Yates-American Machine Co.

**SCREW MACHINES**
**(See Lathes, Turret)**

**SHAPERS, METALWORKING**

**Atlas Press Co.**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
**Howard & Smith, Inc.**
**Lewis Machine Tool Co.**
**Logan Engineering Co.**
Patterson Bros.
Sales Service Machine Tool
**Sheldon Machine Co.**
**South Bend Lathe Works**

**SHAPERS, WOODWORKING**

**Atlas Press Co.**
Balko Tool & Machine Co.
**Boice-Crane Co.**
**Brodhead-Garrett Co.**
**Delta Power Tool Division**
DeWalt, Inc.
Duro Metal Products Co.
J. A. Fay & Egan Co.
**Greenlee Bros. & Co.**
Howard & Smith, Inc.
Lewis Machine Tool Co.
Millers Falls Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Stanley Electric Tools
**Walker-Turner Division**
J. D. Wallace & Co., Inc.
Yates-American Machine Co.

**SHEETMETAL EQUIPMENT**

Balko Tool & Machine Co.
**Brodhead-Garrett Co.**
Howard & Smith, Inc.
Patterson Bros.
**Peck, Stow & Wilcox Co.**
J. A. Richards Co.
Stanley Tools
Stanley Electric Tools
W. Whitney Stueck, Inc.

**SHEETMETAL KITS**

Balko Tool & Machine Co.
Brodhead-Garrett Co.
J. C. Larson & Co., Inc.
Metal Goods Corp.

**SHELVING, STEEL**

Brodhead-Garrett Co.
Hallowell Div., Standard Pressed Steel Co.
E. H. Sheldon Eqpt. Co.

**SHOP COATS, APRONS**

Alvin & Co., Inc.
Can-Pro Corp.
**Craftsman Wood Service Co.**
Modern School Supplies
**School Products Co.**

**SHOP FURNITURE**

Ajusto Eqpt. Co.
**Brodhead-Garrett Co.**
Can-Pro Corp.
Federal Hardware Prods., Inc.
Garrett Tubular Prods., Inc.
**Howard & Smith, Inc.**
Modern School Supplies
**Parent Metal Prods., Inc.**
Patterson Bros.
E. H. Sheldon Eqpt. Co.
**Stacor Equipment Co.**
Standard Pressed Steel Co.
**Tolerton Co.**

**SILK SCREEN MATERIALS**

Brodhead-Garrett Co.
DonJer Products Co.
Leeds Sweete Products, Inc.

**SNIPS, SHEETMETAL**

Balko Tool & Machine Co.
Billings & Spencer Co.
**Brodhead-Garrett Co.**
Burstein-Applebee Co.
Garrett Tubular Prods., Inc.
**Howard & Smith, Inc.**
Patterson Bros.
**Peck, Stow & Wilcox Co.**
Patterson Bros.
Skil Corp.
Stanley Electric Tools

**SOLDERING EQUIPMENT**

American Electrical Heater Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
Grieger's Inc.
C. R. Hill Co.
**Howard & Smith, Inc.**
Linde Co.
Patterson Bros.
Sax Brothers, Inc.
**Stanley Tools**
Tolerton Co.

**SOLDERS AND FLUXES**

**Brodhead-Garrett Co.**
Burstein-Applebee Co.
**Cerro de Pasco Sales Corp.**
Grieger's Inc.
C. R. Hill Co.
**Howard & Smith, Inc.**
Linde Co.
Mico Instrument Co.
**Patterson Bros.**
Sax Brothers, Inc.

**SQUARES, PRECISION**

Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
**Howard & Smith, Inc.**
**Lufkin Rule Co.**
**Millers Falls Co.**
Montgomery & Co., Inc.
Patterson Bros.
George Scherr Co., Inc.
L. S. Starrett Co.

**SQUARES, WOODWORKING**

Balko Tool & Machine Co.
**Brodhead-Garrett Co.**
Albert Constantine & Son, Inc.
**Craftsman Wood Service Co.**
**Howard & Smith, Inc.**
**Millers Falls Co.**
Patterson Bros.
**Stanley Tools**
L. S. Starrett Co.

**SURFACERS**
**(See Planers, Sanders)**

**TAPES, MEASURING**

Alvin & Co., Inc.
Balko Tool & Machine Co.
**Brodhead-Garrett Co.**
Burstein-Applebee Co.
**Evans Rule Co.**
**Howard & Smith, Inc.**
Keuffel & Esser
**Lufkin Rule Co.**
Millers Falls Co.
Modern School Supplies
Patterson Bros.
H. K. Porter Co., Henry Disston Div.
L. S. Starrett Co.
Stanley Tools

**TAPS, DIES**

Brodhead-Garrett Co.
Burstein-Applebee Co.
**Howard & Smith, Inc.**
Modern School Supplies
Patterson Bros.

**TELEPHONE EQUIPMENT**

Telephone Engineering Co.

**TESTING INSTRUMENTS**

Allied Radio Corp.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Burstein-Applebee Co.
**Electronic Instrument Co.**
Heath Co.
Lufkin Rule Co.
Mico Instrument Co.
Moss Electronic Distributing Co., Inc.
Seco Mfg. Co.
Sprague Prods. Co.
L. S. Starrett Co.
**Weston Electrical Inst. Corp.**

**TOOLHOLDERS, LATHE**

**Armstrong Bros. Tool Co.**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Delta Power Tool Div.
**Howard & Smith, Inc.**
Montgomery & Co., Inc.
Patterson Bros.
Sheldon Machine Co.
**South Bend Lathe Works**
**J. H. Williams & Co.**


# CINCINNATI *delivers*

**more of the "must" qualities for training . . .**

*10", 12¼", 15", 18", 21½" and 26" sizes . . . 12 all-geared spindle speeds . . . simple color-match speed selector . . . totally-enclosed, quick-change gear box . . . safe electrical controls.*

**CHECK and compare . . . CINCINNATI is your most practical buy!**

- **RUGGED**—Built for production performance in industry, a CINCINNATI more easily withstands training abuses.
- **RELIABLE**—Built to maintain accuracy, a CINCINNATI is less expensive to keep up . . . *total cost through its long life is extremely low.*
- **REPRESENTATIVE**—Built *for* industry, a CINCINNATI helps the student appreciate precision demanded by industry.
- **SAFE**—Accidents cost *too* much . . . a CINCINNATI more than meets industry's high safety standards.
- **EASY TO OPERATE**—Because time is money, a CINCINNATI is designed for maximum operating ease . . . simplified controls are positive and ready-at-hand for speed with safety.

*Write for details and name of your nearest CL&T Dealer. Ask for bulletin T-133 "How to determine if a lathe will be a money-maker".*

**CINCINNATI LATHE AND TOOL CO.**

3207 Disney St. • Cincinnati 9, Ohio

*"TRAY-TOP" Lathes • "CINCINNATI" Drilling Machines • "SPIROPOINT" Drill Sharpener*

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D. W. Cope Plastics
Craftools, Inc.
Frank Mittermeier
Stanley Tools
X-acto, Inc.

**TUBE CUTTERS & FLARING TOOLS**
Imperial Brass Mfg. Co.
Patterson Bros.

**TWEEZERS, FORCEPS**
Burstein-Applebee Co.
Copper Shop
Grieger's Inc.
Patterson Bros.

**UNIVERSITY & COLLEGE SUMMER SESSIONS**
Univ. of Minnesota
New York Univ.
Oregon State College
Oswego Teachers College
Penn. State Univ.
Stout State College
Wayne State Univ.
Wisconsin State College

**UPHOLSTERY SUPPLIES**
Albert Constantine & Co.
Craftsman Wood Service
John J. Fogarty
Upholstery Supply Co.
Webcraft, Inc.

**VENTILATING SYSTEMS**
National System of Garage Vent.
Ohio Blow Pipe Co.

**VISES, MACHINE SHOP**
Armstrong Bros. Tool Co.
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Columbian Vise & Mfg. Co.
Desmond-Stephan Mfg. Co.
DeWalt, Inc.
Howard & Smith, Inc.
Lewis Machine Tool Co.
Millers Falls Co.
Montgomery & Co., Inc.
Morgan Vise Co.
Patterson Bros.
E. H. Sheldon Eqpt. Co.
Sheldon Machine Co.
Standard Pressed Steel Co.
Tolerton Co.
U.S. Burke Machine Tool Co.
Wilton Tool Mfg. Co.

**VISES, WOODWORKING**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
Columbian Vise & Mfg. Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service
Desmond-Stephan Mfg. Co.
DeWalt Inc.
Howard & Smith, Inc.
Lewis Machine Tool Co.
Machine Shop Project Service
Millers Falls Co.
Morgan Vise Co.
Oliver Machinery Co.
Patterson Bros.
E. H. Sheldon Eqpt. Co.
Standard Pressed Steel Co.
Stanley Tools
Tolerton Co.
Wilton Tool Mfg. Co.

**WELDING EQUIPMENT**
Brodhead-Garrett Co.
Howard & Smith, Inc.
Lincoln Electric Co.
Linde Co.
Marquette Mfg. Co., Inc.
Patterson Brothers
Ruemelin Mfg. Co.

**WELDING EQUIPMENT, GAS**
Brodhead-Garrett Co.
Howard & Smith, Inc.
Linde Co.
Marquette Mfg. Co., Inc.
Patterson Brothers

**WOODSHOP SUPPLIES**
**(See also item wanted)**
Balko Tool & Machine Co.
Brodhead-Garrett Co.
M. L. Campbell Co.
Albert Constantine & Son, Inc.
Craftsman Wood Service Co.
DonJer Products Co.
"Dowl-It" Co.
Freeman Supply Co.
General Finishes Sales & Service
Howard & Smith, Inc.
Kindt-Collins Co.
Minnesota Woodworkers Supply Co.
Parent Metal Products, Inc.
Patterson Brothers
Frank Paxton Lumber Co.
Red Devil Tools
Rogers Isinglass & Glue Co.
Southern Screw Co.
Upholstery Supply Co.
Wetzler Clamp Co.
Woodcraft Supply Co.

**WOODWORKING EQUIPMENT**
**(See also item wanted)**
Balko Tool & Machine Co.
Baker-Crane Co.
Brodhead-Garrett Co.
Albert Constantine & Son, Inc.
Dalton Mfg. Co.
Delta Power Tool Div.
DeWalt Co.
DonJer Products Co.
"Dowl-It" Co.
Duro Metal Products Co.
J. A. Fay & Egan Co.
Federal Hardware Prods., Inc.
Freeman Supply Co.
Greenlee Bros. & Co.
Howard & Smith, Inc.
Kindt-Collins Co.
King Mfg. Co.
Lewis Machine Tool Co.
Magna-Set Co.
Minnesota Woodworkers Supply Co.
Morgan Vise Co.
National School Supply
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Parent Metal Products Inc.
Parks Woodworking Machine Co.
Patterson Brothers
Powermatic Machine Co.
Red Devil Tools
Stanley Tools
Tolerton Co.
Walker-Turner Division
J. D. Wallace & Co., Inc.
Wetzler Clamp Co.
Wilton Tool Mfg. Co.
Woodcraft Supply Co.
Yates-American Machine Co.

**WOODWORKING KITS, PROJECTS**
Bedford Lumber Co.
DonJer Products Co.
Giles & Kendall Co.
Stacor Equipment Co.
George S. Thompson Corp.

**WRENCHES, ALL KINDS**
Armstrong Brothers Tool Co.
Billings & Spencer Co.
Brodhead-Garrett Co.
Burstein-Applebee Co.
Duro Metal Products Co.
Howard & Smith, Inc.
Millers Falls Co.
Patterson Bros.
Peck, Stow & Wilcox Co.
J. H. Williams & Co.

**WRENCHES, TORQUE**
Millers Falls Co.
Patterson Bros.
P. A. Sturtevant
J. H. Williams & Co.

For Addresses of These Suppliers See Page 62

"TOO MUCH PUSH ON THAT DRILL, HECTOR!"

## AIAA Convention

Remember the 20th Annual Convention of the American Industrial Arts Association, to be held April 29-May 2 in the Hotel Statler, Boston, Mass. Two affiliated groups, the American Council on Industrial Arts Teacher Education and the American Council of Arts Supervisors, also will meet at this time.

Project displays and commercial exhibits will be one of the features. SCHOOL SHOP will be in exhibit booth 12. Be sure to stop in and see us while you are at the convention.

NEW
GREAVES
TOOLMAKERS
OVERARM

Here's the way to add new "firepower" to toolroom milling operations! Install in your toolroom a GREAVES MILL equipped with this new Toolmakers Overarm.

You'll discover new versatility for milling intricate jig and fixture work, for keyWaying, slotting and angular milling. Two graduated swivels permit mounting the spindle head in almost any angle for milling, drilling, spot facing and related operations.

Powered by an independent 2 HP motor, the unit is driven through helical gears. Eight speeds may be selected with convenient controls operating speed change clutches. A hand-fed quill attachment provides 4" tool travel to the spindle. Arbor support fits overarm, permits arbor type milling without changing overarm.

*Write for Complete Specifications and Prices*

- Swivels permit any angular setting of spindle head.
- 2 HP independent motor drive.
- 8 speeds from 175 to 1750 RPM.
- Quill has 4" hand feed.
- Spindle equipped with No. 30 N. S. taper; reduced to No. 2 Morse taper when Quill Attachment is used.
- Gears run in oil bath.
- Full vision oil level gauge.

RACK FEED. The overarm is equipped with rack feed for positioning over work.

GREAVES MACHINE TOOL DIVISION
J. A. FAY & EGAN COMPANY
2300 Eastern Avenue, Cincinnati 2, Ohio

Manufacturers of
GREAVES MILLS
"the MOST Mill for the LEAST Money!"

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**Adjustable Clamp Co.**
405 N. Ashland Ave.
Chicago 22, Ill.

**Ajusto Equip. Co.**
515 Conneaut St.
Bowling Green, Ohio

**Allied Radio Corp.**
100 N. Western Ave.
Chicago 80, Ill.

**Aluminum Co. of America**
425 6th St.
Pittsburgh 19, Pa.

**Alvin & Company, Inc.**
853 Palisado Ave.
Windsor, Conn.

**American Abrasive Metals Co.**
460 Coit St.
Irvington 11, N.J.

**American Air Filter Co., Inc.**
215 Central Avenue
Louisville 8, Ky.

**American Elec. Heater Co.**
6110 Cass Ave.
Detroit 2, Mich.

**American Machine & Foundry Co.**
261 Madison Ave.
New York 16, N.Y.

**American Technical Society**
848 E. 58th St.
Chicago 37, Ill.

**American Type Founders**
200 Elmora Ave.
Elizabeth, N.J.

**Armstrong Bros. Tool Co**
5252 W. Armstrong Ave.
Chicago 30, Ill.

**Atlas Press Co.**
19-122 N. Pitcher St.
Kalamazoo, Mich.

**Baldor Electric Co.**
4325 Duncan Ave.
St. Louis, Mo.

**Balko Tool & Machine Co.**
6666 N. Western Ave.
Chicago 45, Ill.

**Barrett Equipment Co.**
21st & Cass
St. Louis, Mo.

**Bedford Lumber Co.**
P.O. Box 65
Shelbyville, Tenn.

**Bellman Pub. Co.**
P.O. Box 172
Cambridge 38, Mass.

**Chas. A. Bennett Co., Inc.**
217 N. Monroe St.
Peoria, Ill.

**Bergen Arts & Crafts**
300 S. W. 17th Ave.
Miami, Fla.

**Berger Scientific Supplies, Inc.**
41 Williams St.
Roxbury,
Boston 19, Mass.

**Berkroy Products Co.**
2516 N. Ontario St.
Burbank, Calif.

**Charles Beseler Co.**
219 S. 18th St.
East Orange, N.J.

**Better Light Better Sight Bureau**
420 Lexington Ave.
New York 17, N.Y.

**Billings & Spencer Co.**
1 Laurel St.
Hartford 1, Conn.

**Blackhawk Mfg. Co.**
Milwaukee, Wis.

**Boice-Crane Co.**
930 W. Central Ave.
Toledo 6, Ohio

**Borden Company Chemical Division**
350 Madison Ave.
New York 17, N.Y.

**Brett-Guard Co.**
105 S. Dean St.
Englewood, N.J.

**Brodhead-Garrett Co.**
4560 E. 71st St.
Cleveland 5, Ohio

**Brown & Sharpe Mfg. Co.**
235 Promenade St.
Providence, R.I.

**Brunner Div., Dunham-Bush, Inc.**
1821 Broad St.
Utica 1, N.Y.

**Charles Bruning Co., Inc.**
1800 W. Central Rd.
Mt. Prospect, Ill.

**Burstein-Applebee Co.**
1012-14 McGee St.
Kansas City 6, Mo.

**Cadillac Plastic & Chemical Co.**
15111 Second Ave.
Highland Park, Mich.

**M. L. Campbell Co.**
2909 Chrysler Rd.
Kansas City, Kans.

**Can-Pro Corp.**
19 E. McWilliams St.
Fond du Lac, Wis.

**Casting Specialties Co.**
Thiensville A, Wis.

**Cerro de Pasco Sales Corp.**
300 Park Avenue
New York 22, N.Y.

**Challenge Machinery Co.**
First St.
Grand Haven, Mich.

**Chandler & Price Co.**
6000 Carnegie Ave.
Cleveland 3, Ohio

**Chicago-Latrobe**
411 W. Ontario St.
Chicago 10, Ill.

**Chilton Co.**
56th & Chestnut Sts.
Philadelphia 39, Pa.

**Cincinnati Lathe & Tool Co.**
4701 Marburg Ave.
Cincinnati 9, Ohio

**Cincinnati Milling Machine Co.**
4701 Marburg Ave.
Cincinnati 9, Ohio

**Cincinnati Tool Co.**
4059 Montgomery Rd.
Cincinnati 12, Ohio

**Clausing Division, Atlas Press Co.**
19-122 N. Pitcher St.
Kalamazoo, Mich.

**Columbian Vise & Mfg. Co.**
9021 Bessemer Ave.
Cleveland 4, Ohio

**Albert Constantine & Son, Inc.**
2050 Eastchester Rd.
Bronx 61, N.Y.

**D. W. Cope Plastics**
11640 Bellefontaine Rd.
St. Louis 15, Mo.

**The Copper Shop**
2185 E. 14th St.
Cleveland 14, Ohio

**Cotton-Hanlon Inc.**
Odessa, N.Y.

**Craftools, Inc.**
396 Broadway
New York 13, N.Y.

**Craft Service**
337 University Ave.
Rochester 20, N.Y.

**Craftsman Supply House**
35 Browns Ave.
Scottsville, N.Y.

**Craftsman Wood Service**
2727 S. Mary St.
Chicago 8, Ill.

**C-Thru Ruler Co.**
385 Capitol Ave.
Hartford, Conn.

**Custom Craft**
1700 Niagara St.
Buffalo 7, N.Y.

**Dake Corp.**
620 Robbins Rd.
Grand Haven, Mich.

**Dalton Mfg. Co.**
30 S. Central Ave.
St. Louis 5, Mo.

**Dearborn Leather Co.**
8625 Linwood
Detroit 6, Mich.

**Delco-Remy Div. General Motors Corp.**
2401 Columbus Ave.
Anderson, Ind.

**Delmar Publishers, Inc.**
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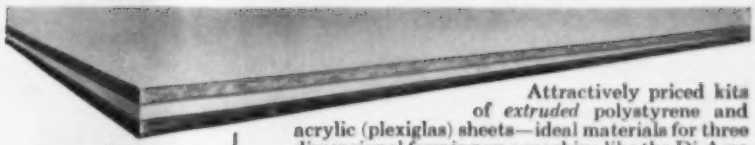

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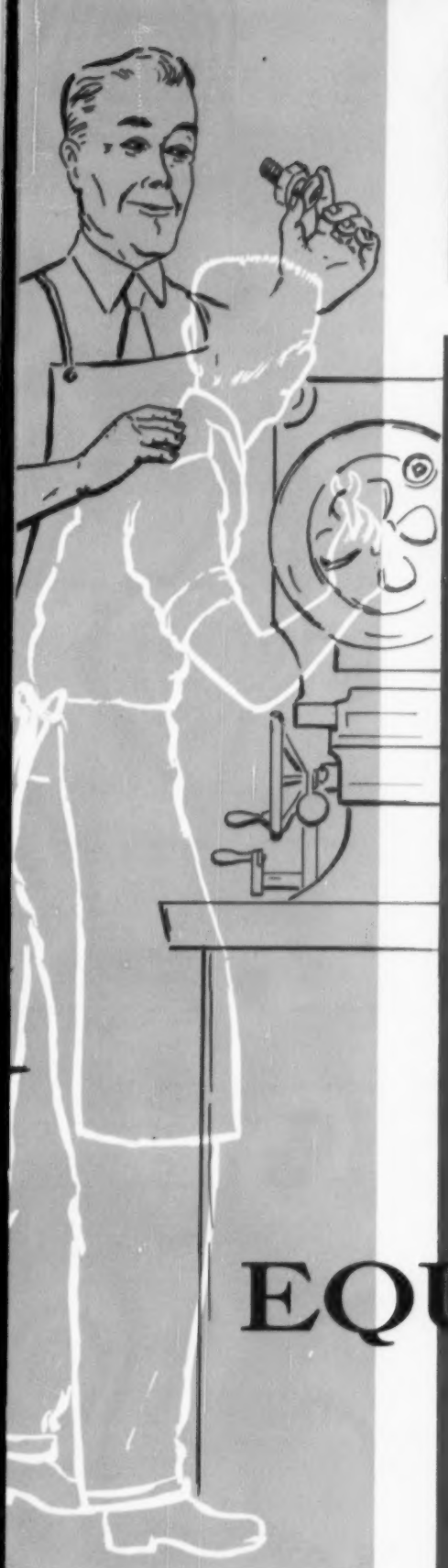

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### Picture Bulletin

The Pennsylvania Industrial Arts Association has enthusiastically endorsed the industrial-arts bulletin published by the Cumberland Valley Joint School System as an effective way to tell what their shop program does.

Amply illustrated, and using the journalistic technique of picture magazines, the bulletin graphically shows students working in woodworking, metalworking, drafting, etc.

Stress is placed on the necessity of safety in the shop and the careful use of expensive tools and equipment. This idea has spread to other systems in the area, including Philadelphia.

### All Shutterbugs Invited

The graphic-arts departments of all Tucson, Arizona, high schools, the *Tucson Daily Citizen*, and the Graflex Corporation, cosponsored a Tucson High School Photography Workshop.

Townsfolks and students heard experts from various manufacturers of photographic equipment discuss such subjects as "Color Photography Unlimited," "Lighting as You Like It," "New Ways in Color Printing," and "The Big Picture."

The movie, "Arizona Birds," was also part of the weekend-long program. How the movie was made was described to the audience.

Photography equipment displays were set up by several firms for inspection by the hundreds of persons who attended the show.

### Teacher-Student Fair Project

One hundred and sixteen boys and girls and 36 teachers, representing 23 schools, participated in the Seventh Annual Industrial Arts Exhibit at the New York State Fair held in Syracuse.

The exhibit was sponsored by the Central New York Industrial Arts Association, the New York State Steering Committee for Industrial Arts, and the Bureau of Industrial Education.

More than 100,000 people saw the display that carried out the theme "Today's Youth—Tomorrow's Industry."

The display consisted of pupil demonstrations representing industrial mass-production methods and student projects. In addition, more than 45,000 wallet-sized calendars bearing a picture and word description of industrial-arts education were distributed.

### Teacher-Recruitment Stunt

Chapters of Kappa Delta Pi and Epsilon Pi Tau, two professional honorary societies, at Oswego, N.Y., State Teachers College recently exhibited the various aspects and benefits of teaching as a profession in two theater lobbies.

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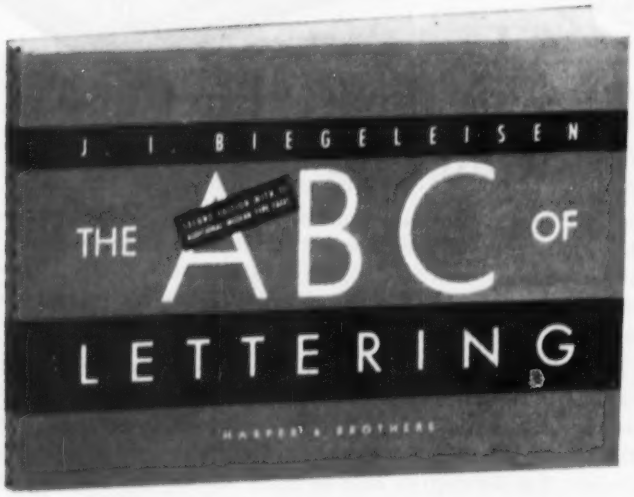


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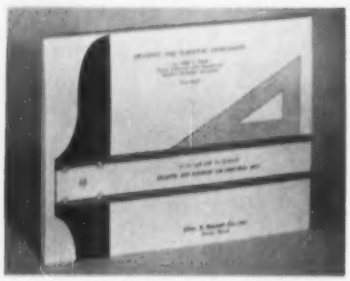

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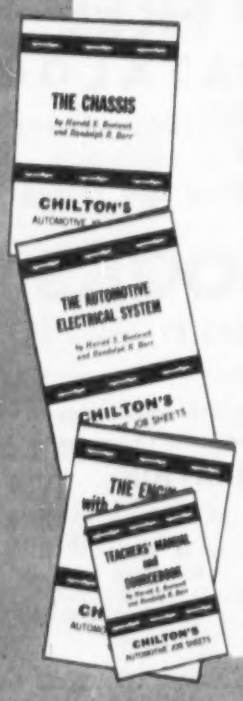


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*Frequency-Modulated Radio.* Rev. ed. Sturley. Macmillan. $3.00.

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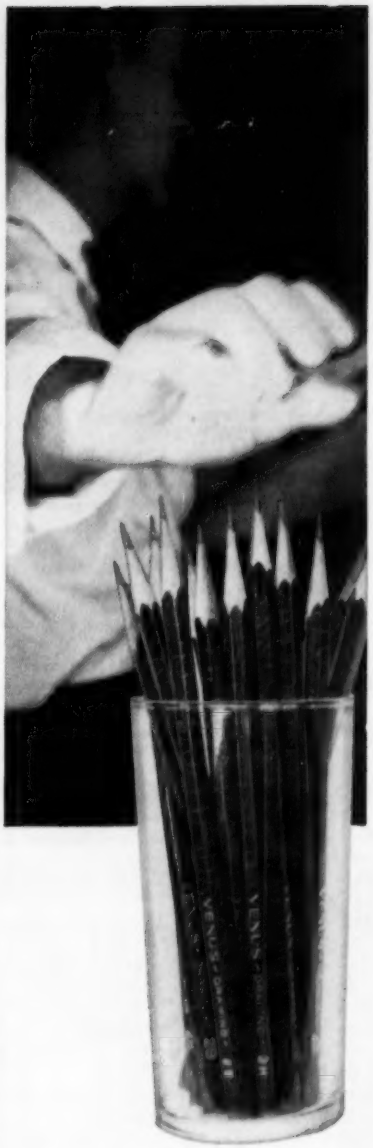

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**The Art of Making Mosaics.** Louisa Jenkins and Barbara Mills. Princeton, N.J.: D. Van Nostrand Company, Inc., 1957. Pp. xiv+132. $5.95.

This book is a thorough introduction to the rewarding, age-old craft of mosaic art. It offers complete guidance to the beginner as well as interesting information for the advanced and professional craftsman.

The book includes an account of Italian mosaic making and also includes a chapter on contemporary mosaicists and their work. A directory of sources of supply is included.

With the recent renewed interest in mosaics, craft teachers will find this volume helpful.

**How to Make Ceramics.** Gertrude Engel. New York: Arco Publishing Company, 1957. Pp. 144. $2.00.

This well-illustrated book follows the how-to formula. Step-by-step instructions help the beginner progress from the first ash tray to making more elaborate projects.

A glossary of ceramic terms is included as well as a list of manufacturers of ceramic supplies.

**Antennas** and **Wave Propagation.** Alexander Schure. New York: John F. Rider Publisher, Inc., 1957. Pp. vii+79 and vii+56. $1.50 and $1.25, respectively.

*Antennas* is Vol. 14 in the Electronic Technology Series. It covers both theory and practical application. Subjects include transmission lines, the basic antenna input impedance, polarization, etc., from the basic dipole through parasitic arrays, long wire, and other varieties of antenna.

*Wave Propagation*, Vol. 11 in the above mentioned series, deals with the fundamental nature of electromagnetic radiation covering the various factors involved in the makeup and transmission of electromagnetic waves with emphasis on the propagation of these waves.

**Arc Welding Lessons for School and Farm Shop.** (Second Edition.) Kugler. Cleveland: James F. Lincoln Arc Welding Foundation, 1957. Pp. xi+343. $1.00.

In this edition some of the chapters have been rewritten and rearranged to be consistent with modern practice in school and farm shops. However, the organization of the book, lesson sequence, paging, and much of the text is unchanged. Because of this it is possible to use both editions together in a class, without causing confusion.

Harold L. Kugler is professor of farm mechanics, Kansas State College of Agriculture and Applied Science.

**Automotive Engines—Maintenance and Repair.** (Second Edition.) Venk. Chicago: American Technical Society, 1957. Pp. xiv+402. $5.95.

This edition has been revised and additional illustrations have been introduced in order to bring it into harmony with the changes that have taken place in the design of automobile engines.

Ernst Venk is coordinator, automotive training, Henry Ford Community College, Dearborn, Mich.

**Basic Electricity.** Turner. New York: Rinehart & Co. Inc., 1957. Pp. xiv +396. $6.50.

This volume carries the reader through a series of topics related to the field of electricity. It provides a clear explanation of such subjects as alternating current, magnetism and electro-magnetism, capacitors, inductors, transformers, and generators. In addition, there are chapters on such practical subjects as illumination, telephone and telegraph, and electrical measuring instruments.

At the end of each chapter is a summary of the points covered, and a list of questions are included as an aid to the student in his study.

Rufus P. Turner is a professional engineer who has had wide experience in this field.

**Blueprint Reading and Sketching for Electrical Trades—Commercial.** Albany, N.Y.: Delmar Publishers, 1957. Pp. vi+152. $2.50. Answer Book $1.00.

In order to make the text in this book more specific, all of the material included is based on actual conditions found in a commercial building of moderate size. Eleven blueprints, showing the plans of this building, are included in an envelope at the back of the book.

The book is divided into units, each unit covering the requirements of a specific type of business. Each unit contains a discussion of the topic under consideration. A definite assignment, based on the discussion, is presented in order that the pupil may review what he learned from the text.

Numerous illustrations are presented in order to clarify some of the points made in the lesson.

Industrial-arts pupils, as well as apprentices in the electrical field, will profit from having a copy of the book.

**Asilomar.** New York: American Craftsmen's Council, 1957. Pp. 168. $3.50.

This is a report of the first annual conference of American craftsmen. The conference included leaders in the fields of handcraft, art, education, museums, and industrial design.

There is much of value to industrial-arts teachers in the report, but the discussion of design in the various crafts should be of spe-

cial interest, since a large section of it is devoted to this topic.

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**Printing and Allied Graphic Arts.** Hague. Milwaukee: Bruce Publishing Co., 1957. Pp. x+244. $3.95.

This book is designed to present a broad picture of the printing industry. The chapters include brief discussions of various types of printing, bookbinding, and related technical information. The section devoted to related information touches on how paper is made, kinds and uses of paper, common print-shop style, and print-shop mathematics.

The book is suitable for junior-high school groups who are interested in exploring the field of printing.

C. W. Hague is head of the printing department at State Teachers College, Fitchburg, Mass.

## *Pamphlets:*

**Womanpower: A Statement and Recommendations** is a 39-page summary of the most recent study of the National Manpower Council. It outlines the place of women in the current manpower picture and points up current and future training needs as women have become an increasingly higher percentage of the labor force. Available from the Columbia University Press, New York 27, N.Y.

## *Audio-Visuals:*

**Diversified Occupations** and **The Apprentice** are two color films released by the Virginia State Board of Education. The first shows the operation of a work-study program designed to train high-school students to become craftsmen and technicians and the second explains the apprentice-training program. Available from Film Production Service, State Department of Education, Richmond 16, Va. Rental $4 each, color, or $2, b & w. Prints can also be purchased.

**Time Out for a Hobby** is a 15-minute, color 16mm film issued by the Hobby Industry Association of America, Inc, 1528 Walnut St., Philadephia 2, Pa. Requests for showing the film should be addressed to the Association.

**Wood Saws, Sharpening,** and **Plumbing** are three, multicolored wall charts published by General Motors Corp. *Saws* gives vital information on woodworking saws, special purpose saws, band saws, circular saws, jig and scroll saws, and many others. *Sharpening* describes stones, the approximate edge bevel angles of typical blades, stone care, and detailed information on how to use a stone. *Plumbing* tells about the various types of faucets, fittings, clogged drains, and water-closet tanks and bowls. To obtain the charts, contact your local Chevrolet dealer.


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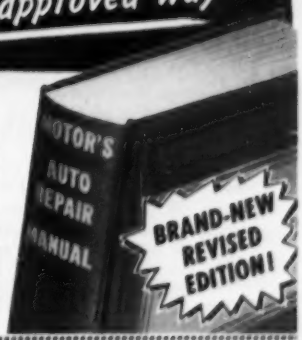


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**Because of the importance of audio-visual aids in teaching shop subjects, SCHOOL SHOP has prepared below a list of latest films, filmstrips, posters and charts, and projection equipment which have become available since this list was last published in April 1957. When writing please mention SCHOOL SHOP. Where no price for purchase or loan of the aid is given, you may obtain this information when you contact the firm. It is usually desirable to give alternate dates when booking films.**

### Automotive

*On Impact, The Stylist,* and *The Smith System* are three films available from the Ford Motor Company. *On Impact* is a 14-minute, 16mm, sound b & w film based on the effectiveness of automobile safety devices. *Stylist* is a 16mm, color, sound movie on the "ins" and "outs" of automobile styling. *Smith System* is an 8-minute, 16mm, b & w, sound movie illustrating five good driving habits. Available from Ford Motor Company Film Library, American Road, Dearborn, Michigan.

*Regulation and the Charging Circuit* is a 35mm color filmstrip, a 12" record, and a leader's guide. Available on a loan basis or purchase from the Technical Editor, Delco-Remy Div., General Motors Corporation, Anderson, Ind.

*20,000 Volts Under the Hood* is a slide-sound color film kit covering the ignition system. Consists of a 35mm film, a 12" record, and a leader's guide. Running time: 12 minutes. Cost $6 for the kit. Technical Editor, Delco-Remy, General Motors Corp., Anderson, Ind.

### Crafts

*"Suede-Tex" Visual Aid Boards.* DonJer Products Co., 1398 Utica Ave., Brooklyn 3, N.Y.

*Time Out for a Hobby* is a 15-minute color, 16mm film issued by the Hobby Industry of America, Inc. Rental free. Hobby Industry Association of America, Inc., 1528 Walnut St., Philadelphia 2, Pa.

### Drafting and Mechanical Drawing

*American Drawing Series* is a compilation of three sets of visual aids dealing with mechanical drawing—six filmstrips, eight films, and seven follow-up filmstrips. McGraw-Hill Text-Films, 330 W. 42nd St., New York 36, N.Y.

*Three Dimensional Drafting* is a 16mm film, two reels long, that compares three-dimensional drafting technique with the more conventional methods. Available on loan basis from John R. Cassell Company, Inc., 110 W. 42nd St., New York 36, N.Y.

### Graphic Arts

*Wall Charts for Bookbinding.* G. A. Pratt Company, 1108 W. Chicago Ave., East Chicago, Indiana.

### Machine Shop and Metalworking

*Blue Print Chart* showing correct protractor angles to which bits for Armstrong Tool holders should be ground for average work. Armstrong Bros. Tool Co., 5252 W. Armstrong Ave., Chicago 30, Ill.

*Free or Inexpensive Teaching Devices in the Field of Metalworking* is a 13-page up-to-date listing of teaching devices in the field of metalworking and the industrial sources from which they may be obtained. Includes wall charts, literature, projects, safety instruction, shop plans. Department of Industrial Education, College of Education, Wayne State University, Detroit 2, Mich.

*Machining Stainless Steels* is a 30-minute, sound movie showing the development of free-machining steels that can be worked at high rates of production. Jam Handy Organization, 2821 E. Grand Blvd., Detroit 11, Mich.

### Welding

*Welding Cast Iron with the Arc Welder; Hard-Surfacing Farm Equipment with the Arc Welder;* and *Heating, Brazing, Soldering, and Cutting with the Arc Welder* are three filmstrips containing 40-45 frames each showing step-by-step procedure. Quizzes and answers are included. Cost is $1 each in the U.S., $1.50 elsewhere. James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio.

### Woodworking

*Boring Tools for Woodworking* is a b & w 35mm filmstrip series illustrating the different types and uses of boring tools. Nine strips in the series. $5 for the entire set. Stanley Tools, Educational Dept., 111 Elm St., New Britain, Conn.

*For Proper Vise Care* is an 11" x 16" wall chart or an 8½" x 11" notebook sheet. Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland 4, Ohio.

*Skil's Perma-Grit Abrasives* are the subject of a 16-minute sound, color film, which shows the uses of the new Perma-Grit tungsten carbide abrasives in cutting, sanding, and finishing of wood, compositions, and plastics. Skil Corporation, 5033 Elston Ave., Chicago 30, Ill.

*Wood Saws* and *Sharpening* are two multi-colored wall charts published by the General Motors Corp. *Saws* gives information on all types of saws. *Sharpening* describes stones, their use and care. Available from your local Chevrolet dealer.

*Wood Screw Boring Chart* is a convenient wall chart listing hole sizes for wood screws. Greenlee Tool Co., 2136 Twelfth St., Rockford, Ill.

### Miscellaneous

*Chameleon of Metals* is an 18-minute, 16mm sound motion picture dramatizing aluminum's versatility and texture possibilities. Alcoa Motion Picture Section, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

*Diversified Occupations* and *The Apprentice* are two color films showing the operation of a work-study program and the apprentice-training program. Rental $4 each, color, or $2, b & w. Prints can also be purchased. Film Production Service, State Department of Education, Richmond 16, Va.


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*Clear-a-Slide* is a kit to permit easy preparation of slides and vu-graph transparancies in color. Kits available in 3¼"x4", 5"x5", 7"x7" and 10"x10" sizes. Charles Beseler Company, 219 S. 18th St., East Orange, N.J.

*Films for Business and Industry* lists professional level movies in b & w or color that describe everything from time-and-motion studies to application of electronic computers. Educational Films Sales Dept., University of California, Los Angeles 24, Calif.

*Industrial Education in Your Future* is a 21-minute, sound, color film which shows high-school students how their interests in industrial education may be directed toward a college career or a career in industrial technology. Available from John A. Jarvis, dean, division of industrial education, Stout State College, Menomonie, Wis.

*Motion Pictures from Ford Motor Company* is a catalog listing all the movies available, from the films produced in 1950 to those produced in 1957. Ford Motor Company Film Library, American Road, Dearborn, Michigan.

*Plumbing* is a multicolored wall chart published by the General Motors Corp. Gives details on the various types of faucets and fittings. Available from your local Chevrolet dealer.

*Reference and Audio-Visual Materials on Iron and Steel*, a teachers guide to materials produced by American Iron and Steel Institute, lists films suitable for industrial-arts and vocational-education classes. American Iron and Steel Institute, 150 E. 42nd St., New York 17, N.Y.

*Simple Machines* is a 24-frame filmstrip showing the uses of the lever, inclined plane, wedge, wheel and axle, pulley, and screw. The Visual Education Consultants, Inc., Madison 4, Wis.

*Steel Valley* is an 18-minute sound film on the rare and little-known super alloys and reactive steels needed in the atomic age. The film, made for the Industrial Information Institute, Youngstown, Ohio, is available from Schmidt Associates, 342 Madison Ave., New York, N.Y.

*Teacher Film Guides* is a booklet containing analyses of 23 films available from a number of sources for aids in driver-education courses. Discussion questions and a brief test are included in each analysis. Cost is $.30. The booklet is available from the Institute of Public Safety, The Pennsylvania State University, University Park.

*Teaching and Training with Tape Recorders, Teaching and Training with Filmstrips and Slides, Teaching and Training with Motion Pictures (Optical Sound)*, and *Teaching and Training with Motion Pictures (Magnetic Sound)* are four booklets on the effective use of audio-visual materials. Educational Sales Department, Bell and Howell, 7100 McCormick Road, Chicago 45, Ill. Cost is 10¢ to cover handling.

*You and the Labor Law* is a two-part, 30-minute sound slidefilm in color describing the history, purpose, and underlying principles of our present labor laws. Available for sale through Employers Labor Relations Information Committee, Inc., 33 E. 48th St., New York 17, N.Y.

*What We Get from Trees* is a 28" x 40" wall chart, revised, available from the Forest Service, U.S. Department of Agriculture, Washington 25, D.C. Single copies free to teachers. Additional copies, 20¢ each. Glossy prints of the chart, 8" x 10", also are available.


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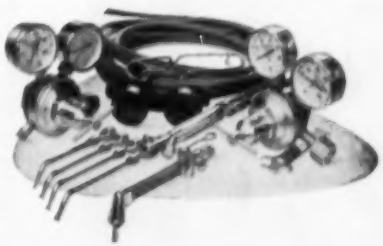

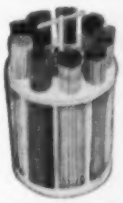

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**Technicians** . . . . . *from page 23*

Field trips are valuable. But too often field trips are casual affairs, poorly planned. The tour leader assigned is not familiar with the needs of the group and an attempt is made to glamorize the industry. Technicians are an intensely practical group and are apt to be cynical toward individuals looking for glamour. These men know their jobs call for hard work, seven days a week, twenty-four hours a day without holidays. Contract requirements of night-shift differential and additional holiday pay aren't always considered sufficient compensation for being away from home. It is important to acquaint the station with the background of the group and purpose of the tour. Don't hesitate to ask if an engineer can be assigned and if possible contact him before the scheduled date so that both of you will know what you want emphasized. Studios and transmitter should be visited together for the complete picture of what is involved in broadcasting and telecasting.

Amateur radio has trained many technicians. This is particularly true in radio. The "ham" gains invaluable experience in his basement. Schools can do much to encourage amateur radio clubs. Classroom work can help the student with the basics needed to obtain the license required by the Federal Communications Commission. Here, as in project work, interest can be stimulated for a later avocation and leisure activity. The licensed amateur is a valuable asset to the community during a time of disaster.

Finally, the school may find the station an invaluable means for getting its story to the community. A certain portion of the programming is public service. A shop demonstration, a science class experiment, a panel discussion on the school-bond issue informs the community and helps the school. A series of well-planned class demonstrations involving some electrical project, e. g., constructing a hi-fi set or a walkie-talkie, will emphasize the importance of the shop and vocational training in the school. When new equipment, new buildings, or more funds are needed, your community will be "sold" on the need—because they know what is going on in the classroom.

Above all it is important that the teacher acquaint himself with broadcasting and the people involved. The broadcast station operates as a public service in the community as well as an advertising medium. Teacher and pupil interest in broadcasting should extend beyond the shop. ★


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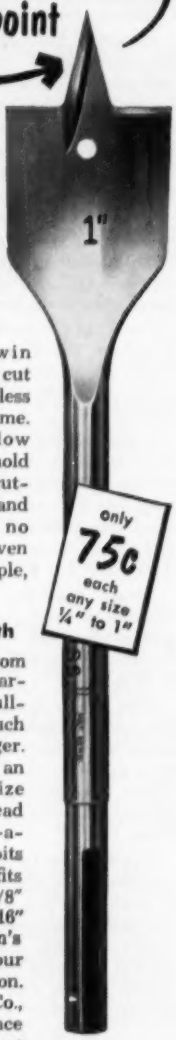
Exclusive hollow ground point

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School Shops using small ¼" electric drills and drill presses can now speed-up class work, increase the boring range of present equipment. New Irwin Speedbor "88" wood bits cut cleaner and deeper with less power and in less time. Irwin's exclusive hollow ground point takes hold faster, new spade-type cutters keep holes clean and accurate. No binding, no clogging, no wobble—even in seasoned hardrock maple, plywood, or plastics.

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Forged in one piece from solid bar of special high carbon steel and hardened full-length to stay sharp much longer, last much longer. Easily resharpened with an ordinary hand file. Size markings shown on head for easy selection. Hang-a-Bit hole lets you store bits on nail or pin. Shank fits perfectly in 1/4", 5/16", 3/8" and 1/2" chucks. Sizes 4/16" to 16/16". Include Irwin's new Speedbor "88" on your next purchase requisition. The Irwin Auger Bit Co., at Wilmington, Ohio, since 1885. *Patented

**SPEEDBOR "88" Sets**

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**Free Catalog No. 52.** Used by many School Shop Instructors as a handy reference and ordering guide. Shows auger bit types, sizes and recommended uses. Write Irwin, Dept. 45, Wilmington, Ohio

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# Directory of Federal and State Officials

**This up-to-date list of federal and state officials in vocational and industrial-arts education has been carefully compiled from authoritative sources. Thanks are due all the state directors of vocational education and the U. S. Office of Education for their help in preparing this directory. Keep this directory for ready reference during the year.**

### U. S. Office of Education Vocational Education Division Washington 25, D. C.

James H. Pearson, assistant commissioner and director for vocational education.
Ward P. Beard, assistant director.
Lane C. Ash, assistant director.

### Trade and Industrial Education Branch

John P. Walsh, director.
Earl M. Bowler, assistant director.
Walter H. Cooper, program specialist, Central region.
Richard S. Nelson, program specialist, Pacific region.
———, program specialist, North Atlantic region.
Edward G. Ludtke, program specialist, Southern region.
Allen T. Hamilton, research specialist.
Mary S. Resh, specialist, training for girls and women.
Howard K. Hogan, consultant, employer-employe relations.

### Secondary Education

Marshall Schmitt, industrial-arts specialist.

### Alabama

R. E. Cammack, director, vocational education, Montgomery 4.
T. L. Faulkner, supervisor, agricultural education, Montgomery 4.
J. F. Ingram, supervisor, trade and industrial education, Montgomery 4.

### Alaska

Howard M. Matthews, director, vocational education, department of education, Juneau.

### Arizona

J. R. Cullison, director, vocational education, Phoenix.
William R. Woodfin, supervisor, trade and industrial education, Phoenix.
Bob E. Taylor, supervisor, agricultural education, Phoenix.

### Arkansas

J. Marion Adams, assistant commissioner for vocational education, Little Rock.
J. C. Ruppert, supervisor, trade and industrial education, Little Rock.
George F. Sullards, supervisor, agricultural education, Little Rock.

### California

Wesley P. Smith, director, vocational education, Sacramento 14.
B. J. McMahon, chief, bureau of agricultural education, Sacramento 14.
Samuel L. Fick, chief, bureau of industrial education, Sacramento 14.
Ernest G. Kramer, assistant supervisor, bureau of industrial education, Sacramento 14.
Van B. Lawrence, regional supervisor, trade and industrial education, Sacramento 14.
G. L. Rosecrans, supervisor in charge of apprentice training, 2082 Center St., Berkeley.
Mack Stoker, regional supervisor, trade and industrial education, Room 809-J, California State Bldg., Los Angeles.
Sidney E. McGaw, regional supervisor, trade and industrial education, 2082 Center St., Berkeley.
H. S. Wood, supervisor, technical education, Sacramento 14.
J. C. Dunbar, special supervisor, foreman training, Room 809-J, California State Bldg., Los Angeles.
David Allen, special supervisor, bureau of industrial education, Room 809-J, California State Bldg., Los Angeles.
Wallace Theilmann, supervisor, instructional materials program, Sacramento 14.
Robert L. Woodward, consultant, industrial-arts education, Sacramento 14.

### Colorado

A. R. Bunger, director, vocational education, Denver.
W. G. Flannery, supervisor, trade and industrial education, Denver.
Harold Bowlds, assistant supervisor, trade and industrial education, Denver.
E. F. Urban, supervisor, apprenticeship, trade and industrial education, Denver.
Carl Ferris, assistant supervisor, apprenticeship, trade and industrial education, Grand Junction.
M. G. Linson, supervisor, agricultural education, Denver.

### Connecticut

Emmett O'Brien, director, division of vocational education, Hartford 15.
G. Wesley Ketcham, consultant, industrial arts, Hartford 15.
Walter Jacoby, consultant, agricultural education, Hartford 15.
R. W. Howes, assistant director, division of vocational education, Hartford 15.
Anna C. Moore, consultant, vocational school general education and libraries, Hartford 15.
Joseph T. Nerden, chief, bureau of technical institutes, Hartford 15.
Lawrence Eddy, consultant, trade and industrial education, Hartford 15.
Walter A. Bialobrzeski, consultant, mathematics and science, vocational schools, Hartford 15.


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Kenneth T. Merrill, consultant, curriculum materials, Hartford 15.
Schuyler Y. Spaulding, consultant, supervisory training, Hartford 15.
Peter W. Bauer, consultant, facilities planning, Hartford 15.
Marjorie J. Geddes, administrative assistant, division of vocational education, Hartford 15.
Joseph Murphy, consultant, audio-visual education, Hartford 15.

### Delaware

R. W. Heim, assistant superintendent for vocational education, 313 S. State St., Dover.
A. B. Anderson, director, trade and industrial education, 511 W. Eighth St., Wilmington 43.
Frank M. Forstburg, supervisor, trades and industries in charge of foreman training, 511 W. Eighth St., Wilmington 43.
W. Lyle Mowlds, director, agricultural education, 313 S. State St., Dover.
Irvan V. P. Chelly, supervisor, trade and industrial education in charge of apprentice training, 313 S. State St., Dover.

### District of Columbia

F. A. Gregory, assistant superintendent, industrial and adult education, Franklin Administration Bldg., Washington 5.
Harold A. Clark, director, industrial and adult education, Wormley School, 3331 Prospect Ave., N.W., Washington 7.
E. P. Westmoreland, supervising director, trade and industrial education, Wormley School, 3331 Prospect Ave., N.W., Washington 7.
W. H. Payne, supervising director, industrial arts, Wormley School, 3331 Prospect Ave., N.W., Washington 7.

### Florida

Walter R. Williams, Jr., director, vocational and adult education, Tallahassee.
Harry E. Wood, supervisor, agricultural education, Tallahassee.
Thurman Bailey, supervisor, trade and industrial education, Tallahassee.
E. A. Emmelhainz, area supervisor, trade and industrial education, Tallahassee.
E. B. Heiny, area supervisor, trade and industrial education, Tampa.
Fred Thornton, area supervisor, trade and industrial education, Jacksonville.
Edwin L. Kurth, consultant, industrial arts, Tallahassee.
B. J. Nelms, educational materials specialist, Tallahassee.
W. L. Lightsey, coordinator, labor-management conference training, Lutz.

### Georgia

George I. Martin, director, vocational education, Atlanta 3.
T. G. Walters, supervisor, agricultural education, Atlanta 3.
W. M. Hicks, supervisor, trade and industrial education, Atlanta 3.
G. F. Mulling, assistant supervisor, trade and industrial education, Atlanta 3.

### Hawaii

W. H. Coulter, deputy superintendent, division of vocational education, Box 2360, Honolulu 4.
Tamotsu Horii, director, agricultural education, Box 2360, Honolulu 4.
Albert J. Feirer, director, trade and industrial education, Box 2360, Honolulu 4.
Lucian J. Paulus, director, industrial-arts education, Box 2360, Honolulu 4.

### Idaho

George E. Denman, director, vocational education, Boise.
S. R. Glenn, supervisor, trade and industrial education, Boise.
J. E. Marmon, area supervisor, trade and industrial education, North Idaho Junior College, Coeur d'Alene.
Ralph Edwards, assistant supervisor, agricultural education, Boise.

### Illinois

J. E. Hill, director, vocational education and chief, agricultural education, Springfield.
Edward M. Claude, chief, trade and industrial education, Springfield.
J. A. King, supervisor, trade and industrial education, Chicago.
Walter J. Bartz, supervisor, trade and industrial education, Springfield.
H. A. Meinert, supervisor, trade and industrial education, Springfield.
Robert B. Newell, supervisor, trade and industrial education, Springfield.
James F. Meyerhofer, supervisor, trade and industrial education, Springfield.
Amos D. Coleman, supervisor, industrial arts, Springfield.
John W. Walgren, supervisor, industrial arts, Springfield.
Eurus Stoltz, supervisor, trade and industrial education, Springfield.

### Indiana

Wilbur Young, superintendent of public instruction and director, vocational education, Indianapolis 4.

W. A. Williams, administrative assistant in charge of vocational education, Indianapolis 4.
Harold Taylor, supervisor, agricultural education, Indianapolis 4.
Donald Pound, supervisor, trade and industrial education, Indianapolis 4.
Edward L. Sell, supervisor, industrial-arts education, Indianapolis 4.

### Iowa

Wayne L. Pratt, director, vocational education, 542 State Office Building, Des Moines 19.
Hampton T. Hall, supervisor, agricultural education, 542 State Office Building, Des Moines 19.
O. H. Beaty, supervisor, trade and industrial education, 542 State Office Building, Des Moines 19.

### Kansas

Walter M. Arnold, director, vocational education, Topeka.
C. C. Eustace, supervisor, agricultural education, Topeka.
Merle W. Bodine, supervisor, trade and industrial education, Topeka.
John Standridge, assistant supervisor, trade and industrial education, Topeka.

### Kentucky

James L. Patton, director, bureau of vocational education, Frankfort.
Orin R. Robinson, supervisor, industrial arts, Frankfort.
E. P. Hilton, director, agricultural education, Frankfort.
Fred A. Martin, director, trade and industrial education, Frankfort.
C. Nelson Grote, assistant director, trade and industrial education, Frankfort.

### Louisiana

A. E. Robinson, assistant superintendent for vocational education, Baton Rouge 4.
T. E. Hampton, director, trade and industrial education, Baton Rouge 4.
H. F. Hayes, assistant director, trade and industrial education, Baton Rouge 4.
W. H. Armstrong, supervisor, industrial training, Baton Rouge 4.
E. A. Lee, trade extension training coordinator, trade and industrial education, Baton Rouge 4.
H. P. Volentine, supervisor, area 1, trade and industrial education, Baton Rouge 4.
H. O. Thomas, supervisor, industrial arts, Baton Rouge 4.
C. T. Houston, director, agricultural education, Baton Rouge 4.

### Maine

Maurice C. Varney, director, vocational education, Augusta.
John A. Snell, director, agricultural education, Augusta.
Arnold McKenney, director, trade and industrial education, Augusta.

### Maryland

H. M. James, director, vocational education and supervisor, trade and industrial education, Baltimore 1.
———, supervisor, agricultural education, Baltimore 1.
Dwight P. Jacobus, supervisor, vocational education services to industry, Baltimore 1.
Frank H. Nachman, supervisor, veterans on-the-job training, Baltimore 1.

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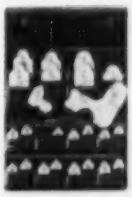

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### Massachusetts

Walter J. Markham, director, vocational education, Boston.
John F. Shea, assistant director, vocational education, Boston.
Leslie J. Nutting, supervisor, industrial schools for boys and men, Boston.
Frederick J. Teed, supervisor, industrial schools for boys and men, Boston.
James L. Burke, supervisor, industrial schools for boys and men, Boston.
William J. McConnell, supervisor, industrial schools for boys and men, Boston.
Francis J. Lombard, supervisor, administration in vocational schools, Boston.
John G. Glavin, supervisor, agricultural schools and departments, Boston.
Jesse A. Taft, supervisor, agricultural schools and departments, Amherst.
Caroline H. Wilson, supervisor, industrial schools, household arts schools and departments for girls and women, Boston.
Anna A. Kloss, supervisor, industrial schools, household arts schools and departments for girls and women, Boston.
John F. Wostrel, supervisor, private trade schools, Boston.
Robert F. Nolan, supervisor, survey and placement, Boston.

### Michigan

Harold J. Van Westrienen, assistant superintendent for vocational education, Box 928, Lansing.
Robert M. Winger, assistant director, vocational education, Box 928, Lansing.
John J. Harris, chief, trade and industrial education, Box 928, Lansing.
Harry E. Nesman, chief, agricultural education, Box 928, Lansing.
Arthur Hansen, consultant, trade and industrial education, Box 928, Lansing.
Harold Bauman, supervisor, private trade schools, Box 928, Lansing.
Lloyd Johnson, consultant, trade and industrial education, Box 928, Lansing.
James Dotseth, consultant, trade and industrial education, Box 928, Lansing.
Harold J. Rosengren, consultant, trade and industrial education, Box 928, Lansing.

### Minnesota

S. K. Wick, acting director, vocational education, St. Paul 1.
George Cochran, supervisor, agricultural education, St. Paul 1.
Dan Turula, assistant supervisor, trade and industrial education, St. Paul 1.
Fred Gordon, assistant supervisor, trade and industrial education, St. Paul 1.

### Mississippi

H. E. Mauldin, director, vocational education, P.O. Box 771, Jackson 5.
A. P. Fatherree, supervisor, agricultural education, P.O. Box 771, Jackson 5.
J. W. Browne, supervisor, trade and industrial education, P.O. Box 771, Jackson 5.
———, assistant supervisor, trade and industrial education, P.O. Box 771, Jackson 5.

### Missouri

H. Pat Wardlaw, assistant commissioner, division of instruction and director, vocational education, Jefferson City.
Merton C. Wheeler, director, industrial education, Jefferson City.
Gordon O. Johnson, supervisor, industrial education, Jefferson City.
Maurice L. Stewart, supervisor, industrial education, Jefferson City.
Carl M. Humphrey, director, agricultural education, Jefferson City.

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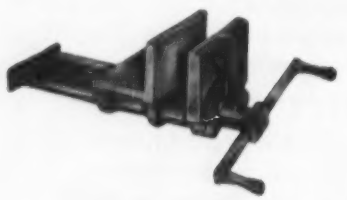

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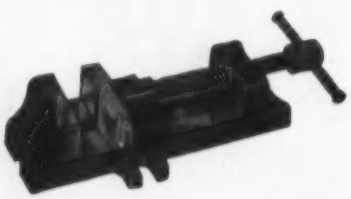

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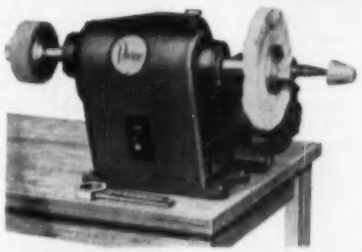

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A very flexible wheel for buffing hard-to-reach surfaces. Moderate cutting action, excellent coloring action on most materials.

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|---|---|---|---|---|---|
| 32 ¼" face | List/Ea. | $ .60 | $ .90 | $1.25 | $2.00 |
| 37 ½" face | List/Ea. | .75 | 1.25 | 2.00 | 3.00 |
| 42 ¾" face | List/Ea. | 1.25 | 1.75 | 3.00 | 4.00 |

### 2. CUSHION SEWED—FULL DISC

Medium density, with good cutting and coloring action for all general purpose buffing.

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| 31 ¼" face | List/Ea. | $ .60 | $ .90 | $1.25 | $2.00 |
| | Circles of sewing | 2 | 2 | 3 | 3 |
| 36 ½" face | List/Ea. | .75 | 1.25 | 2.00 | 3.00 |
| | Circles of sewing | 2 | 2 | 3 | 3 |
| 41 ¾" face | List/Ea. | 1.25 | 1.75 | 3.00 | 4.00 |
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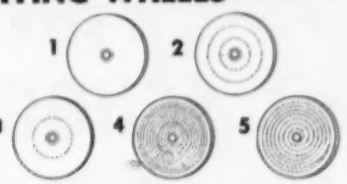


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Production type wheel designed for long use. Excellent for coarse buffing or flexible grinding. Sturdy ¼" spaced spiral sewing.

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| 30 ¼" face | List/Ea. | $ .45 | $1.00 | $1.40 | $2.25 |
| 35 ⅜" face | List/Ea. | .80 | 1.35 | 2.15 | 3.25 |
| 40 ½" face | List/Ea. | 1.35 | 1.90 | 3.20 | 4.25 |

### 5. BUDGET GRADE—SPIRAL SEWED

An inexpensive general purpose wheel for coarse buffing.

| No. | Diameter | 4" | 6" | 8" | 10" |
|---|---|---|---|---|---|
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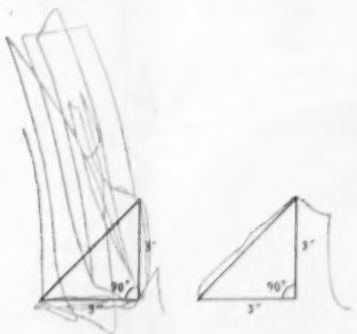
# DRAFTING TIPS

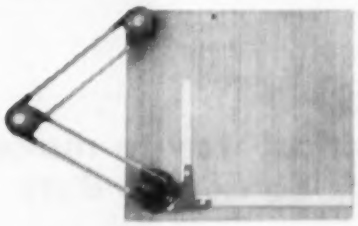
## An example of drafting machine efficiency

The diagram below is a pantographic study of the right hand motion required to draw it. The top figure was drawn with T-square, triangles and scales . . . while the bottom figure was drawn with a drafting machine. In this example the drafting machine reduces hand motion from 20.78 feet to 3.12 feet. The number of distinct right hand motions is cut from 28 to 6.



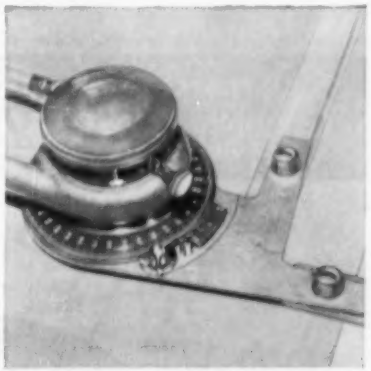

## A drafting machine designed for instructional use

Because of widespread use of drafting machines in industry, it becomes increasingly important that mechanical drawing students be properly instructed in their operation. The Desk-Topper drafting machine is especially suited for school use. Though this completely portable unit is low in cost, it delivers professional accuracy and long service life.



Many teachers have found that drafting machines help to develop a professional attitude among the students. Faster, neater work is the result in most cases.

The Desk-Topper, equipped with C clamps, is very easy to mount or remove from the student's drawing table. The mounting bracket adjusts up and down so that a drawing board



will fit perfectly under the machine. This feature permits layout work on materials of all thicknesses up to ¾". The drawing capacity of the Desk-Topper is 24" x 36". The Desk-Topper is also available complete with a board that folds compactly for safe, convenient storage in drawing table drawers or lockers.

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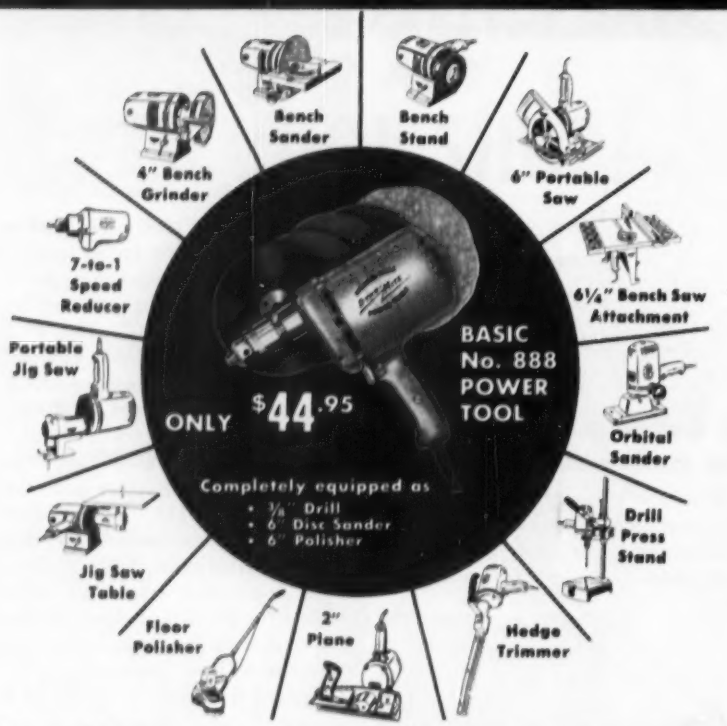


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|---|---|---|
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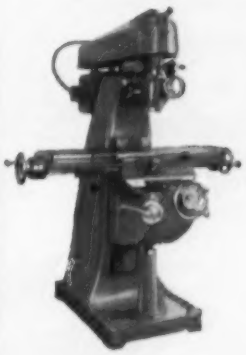
## U.S. VERTICAL MILLING MACHINES



U.S. Vertical Mills—Fine grain alloy steel spindle • Spindle bearings prelubricated, sealed • 24 spindle speeds: 65 to 2850 RPM • 7" head travel • 1 HP drive • Many optional features, including powerfeed to head and table, etc.

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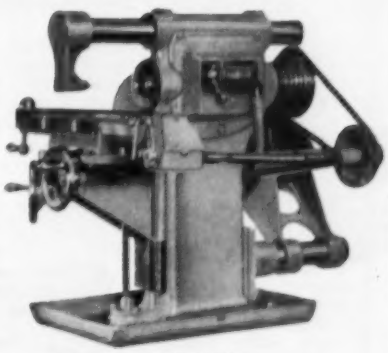

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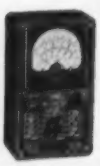

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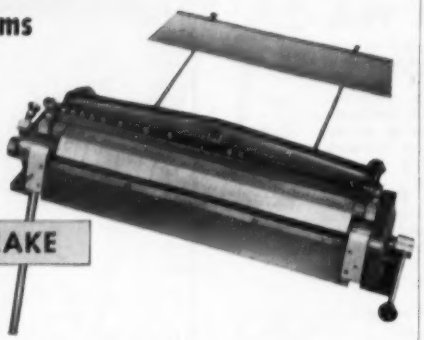

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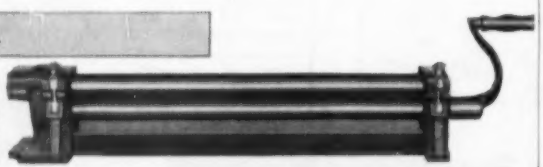

Finger-tip controls on both ends of top roll permit quick adjustment for any material thickness within capacity of unit. Will accurately roll 24" widths in 20 gauge mild steel—heavier gauges in narrower widths. Removal of work is easily accomplished due to the spring loaded, hinged, top roll. Heavy duty rolls 1½" diameter—distortion proof channel iron base, enclosed gears and oilite bearings are a few of many features.

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### Wyoming

Sam Hitchcock, director, vocational education and supervisor, trade and industrial education, Cheyenne.
Percy Kirk, supervisor, agricultural education, Cheyenne.

## *strictly personal

THAINE D. MCCORMICK has been appointed T&I teacher-educator at Kansas State Teachers College, Pittsburg. He was formerly assistant teacher trainer at Oklahoma State University.

ALFRED S. DREW has accepted a position at Purdue University, Lafayette, Ind., where he will teach courses in curriculum and work with groups in teacher-training activities. He had been T&I coordinator at West Allis, Wis., School of Vocational and Adult Education.

CRAIG JOHNSON, president of the Panhandle Industrial Arts Club, has joined the industrial-arts staff of West Texas State College, Canyon. He formerly taught at Hereford, Tex.

JOSEPH T. NERDEN has been appointed chief of the Bureau of Technical Institutes by the Connecticut commissioner of education, William J. Sanders. It was incorrectly reported in these columns that he was appointed to the New York State Education Department.

EDWIN KOMENDAREK, formerly of Little Falls, N.Y., is now director of vocational education at Herkimer.

DEWEY F. BARICH has been chosen president of Detroit Institute of Technology. Presently assistant manager of educational affairs at Ford Motor Company, Barich is a member of the editorial advisory board of SCHOOL SHOP. He will assume his new post May 1.

ROBERT H. PERRY has joined the staff of Purdue University's department of industrial engineering as instructor in electricity. RICHARD M. OUTCALT is a new machine-tool laboratory instructor at Purdue also.

DALE MUSSELMAN, JR., has replaced JOHN TEAGUE as convention manager for Brodhead-Garrett Co., Cleveland. Teague has moved to Orlando, Fla., where he has entered business.

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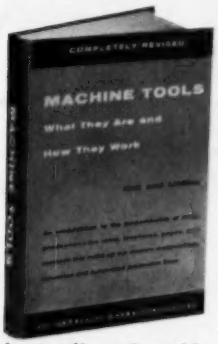


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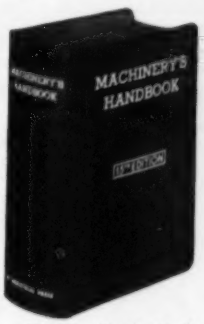


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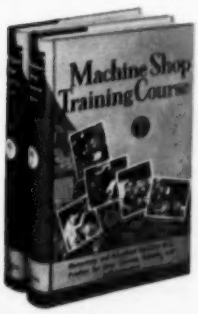


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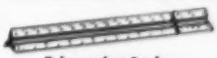

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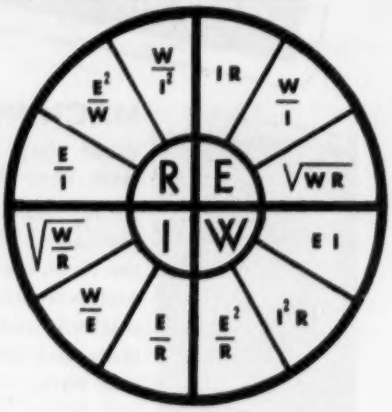
### After They're Read

A handy thing to have in your paint room is a stack of newspapers to work out excess paint from brushes. To keep our room neat we did the following: tore a stack of papers into separate sheets (no folds); piled them into a stack up to 300 sheets; cut a piece of ¾" plywood for backing, approximately 2" larger than the sheet of paper; placed the stack on the backing; cut a narrow strip of ¾" plywood, 3" wide, and bored holes through it and with it clamped the sheets down tight against the backing. The unit now hangs on the wall in our paint room. Nearby is a trash can for students to dispose of used paper after they've torn it off the stack and cleaned out their brushes. —*Donald Kinnaman, Camelback High School, Phoenix, Ariz.*

### Insulating Sleeves

There is often need for small sleeves of insulating material for protecting wires in electronic equipment. Heavy-duty plastic tubing, a good material for this purpose, can be salvaged from some types of ball-point ink cartridges.—*Hugh Lineback, Oklahoma A&M College, Stillwater.*

### Basic Electric Formulas




The chart illustrated is an aid to those who use electrical formulas. Many find it difficult to convert a formula to its simple form. To use the chart, find the desired unknown in the inner circle. Select one of the three formulas in the quarter of the large circle where the unknown is found, which contains two unknown factors, and solve. (The letters represent the following: E-volts; R-ohms; I-amperes; W-watts.)

To illustrate: supposing you want to know the resistance of a toaster which is rated at 1200 w when used on 120 v.

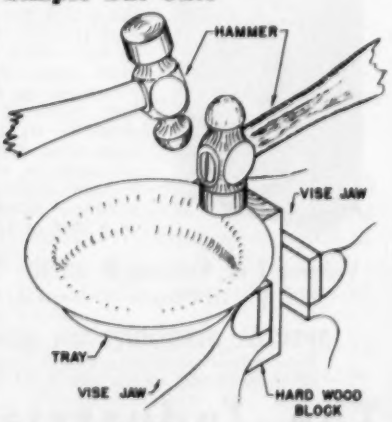
Looking at the chart you will find that

$$R=\frac{E^2}{W}\text{; substituting } R=\frac{120^2}{1200}$$

$$\text{then } R=\frac{120 \times 120}{1200} \text{ or } R=\frac{14400}{1200} \text{ or}$$

R=12.—*Newsletter, College for Teachers, Buffalo, N.Y.*

### Simple but Cute




If you should have a tray being formed on a sand bag in your shop and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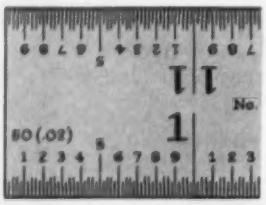

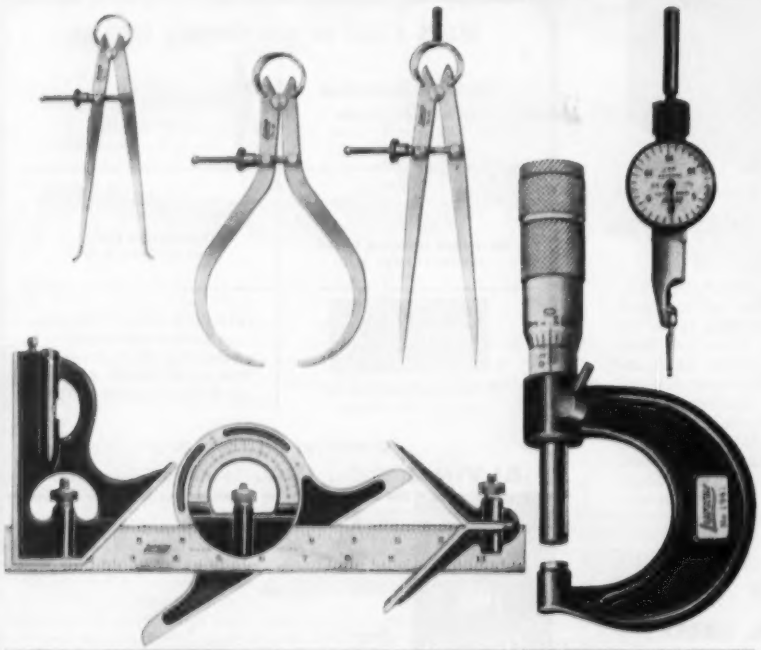

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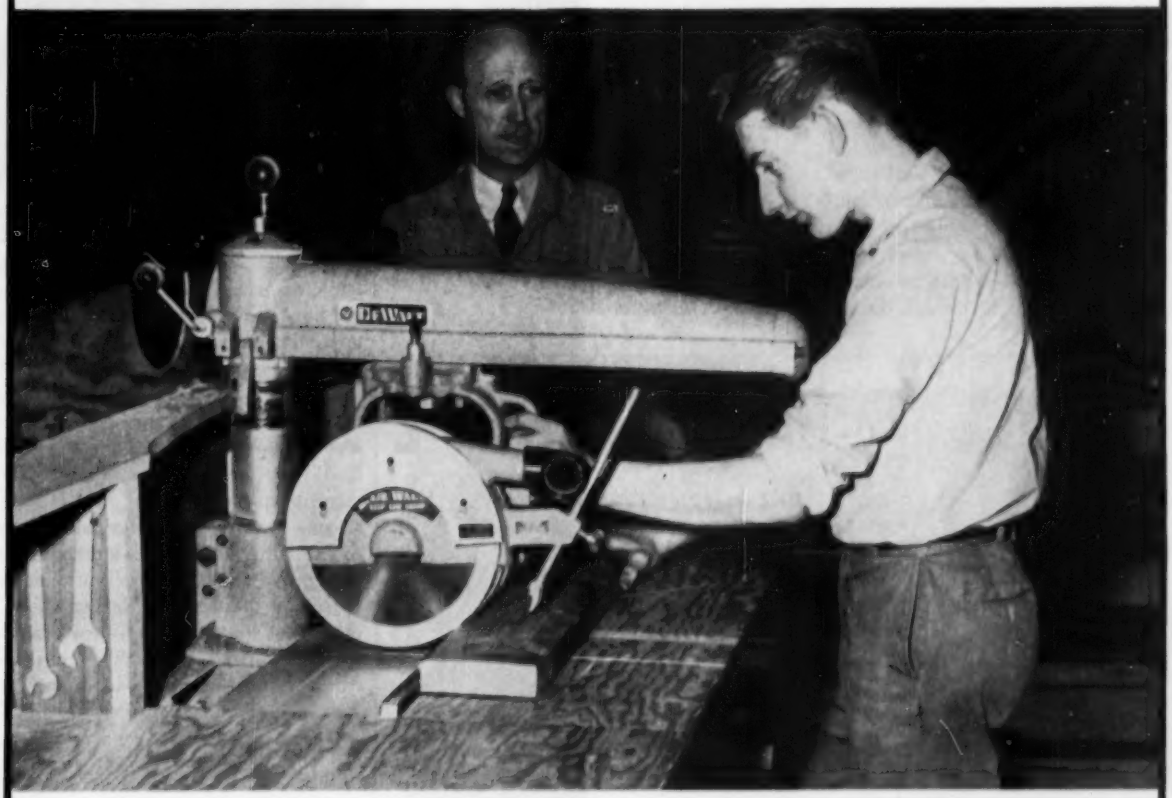

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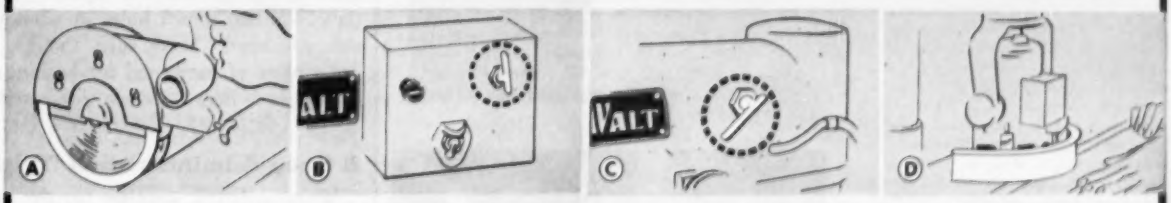


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the resulting edge is not uniform, perhaps this will help you to finish the job. Place a piece of hard maple in a vise. Extend it above the jaws, as shown in the drawing, as high as you want the tray to be deep. Strike the tray on the top with a hammer and on the turn between the rim and tray proper.—*Henry J. Kauffman, Millersville, Pa.*

### Flatten First, Then Cut

To overcome the difficulty of cutting small snippets of soft solder for delicate soldering operations, have your students flatten the standard solid wire solder by rolling a length of it through the sheet-metal forming rolls. After it has been flattened to about 1/32", it is a relatively easy matter to cut any desired snippet.—*J. Hugh Capron, Winona State College, Winona, Minn.*

### A Rule Will Help

A 6" rule fastened next to your screw and nail storage facility will remind students in your shop to return screws and nails to their proper containers and compartments according to size. The lads will be able to measure each of the items accurately and deposit them accordingly.—*Stanley F. Schneck, Southern Lehigh High School, Coopersburg, Pa.*

### Assembly Table

A handy assembly table can be constructed from 1"x12"x10' stock. Space is provided for bar clamps in one end while assorted hand screws and clamps are hung from the edge. The ridge along the front and on the right end of the table are screw fastened to the top surface to form a right angle. When assembling frames, counters, etc., the parts may be moved to the corner and assembled. The parts will be square without using a square to check. A steel tape is set in a groove on the edges of the ridge.

The entire unit stands on saw horses for normal small construction or it may be set on the floor for larger tables or chests. A power outlet provides electricity for power tools. The entire unit can be leveled up to provide a large true surface.—*Robert S. Tupper, Canton, S.D.*

### Punching Leather

When leather punches are needed in your shop, you can make them by selecting nails or bolts of the needed sizes and cutting the ends off square. With these you can punch holes of whatever size you need. Make sure, though, to use a piece of hardwood for backing.—*Harry J. Miller, Gillespie Junior-High School (on leave), Philadelphia, Pa.*

### A Shop Administration 'Trick'

When ordering supplies for the current year, keep the box cover or label of the item each time you empty a box. Next year tally all the labels used during this year, allow for waste, and make your next requisition from this tally.

This saves time, confusion, and assures getting the proper item.—*A. M. Reinhold, West Fulton High School, Atlanta, Ga.*

### Use a Soldering Gun

Use a soldering gun for the heat supply when softening stick shellac to fill holes or blemishes in wood. The 100-w gun, with a flat tip, is light and easy to manipulate. It delivers an adequate amount of heat in a very short time.

Use a small brass suede brush to clean any excess shellac from the tip of the gun after the operation.—*Kenneth B. Bennett, Newport News, Va., High School.* ★

Photo above shows collector on shop roof and scrap discharge door in side of building. This unique system at the Carlisle Senior High School, Carlisle, Pa., accommodates all dust and scrap from the shop shown at right. All piping is below floor level under grating to best utilize all available working space, and to give the students maximum visibility and freedom of movement around machines.

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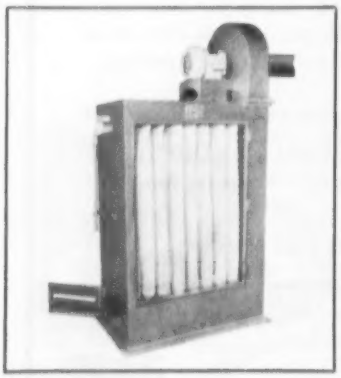

This OBP portable unit is complete with exhauster, motor and filter bags. Dust which is picked up from machines is deposited in a storage compartment and the clean air is returned to the shop.

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## IN THE *Morning Mail*.

[Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Dear Sirs,

I don't know whether SCHOOL SHOP carries torch-bearing material, but I think it is high time that something be printed about the exploitation of printing students and teachers.

During the past 11 years I have taught printing under the supervision of four principals. My present principal is the first one in this time to come to the fore and state, "Production be damned, let's teach printing!"

Most schools have administrators who take advantage of their position and thrust job after job on the printing teacher until he is forced, in the interests of selfpreservation, to leave printing and teach drafting or industrial mathematics or some other subject that does not have the production requirements found in printing classes.

Under the pressure of time for production, much "misteaching" is done in the print shop. Many times a boy who can run a press particularly well or set type well is left at this level of learning because the instructor can depend on him for quick, accurate work. By work I mean jobs that the administration has given him to perform, usually to be completed by a certain date.

There is a great injustice done the youngster who is coddled into working on the press for free after school in order to get out the school paper or graduation program. I'm a great believer in equal pay for equal work. If the cafeteria worker gets a free meal for his work and the football coach gets extra pay for coaching the team, the extra pay should be forthcoming to the printing student and instructor who work after hours.

*Charles C. Brady,*
High School, Reseda, Calif.

Dear Sirs,

I just received the February issue of SCHOOL SHOP and finished reading your editorials. May I take this opportunity to compliment you on both. "Needed: Another Journal" is certainly timely; especially is it timely in view of the current emphasis on industrial and scientific research.

"The Sputnik Syndrome" is likewise of paramount importance to every educator in America. It should be required reading for all. My compliments!

*Alfred A. Lease,*
Sauk Rapids, Minn.,
President, Minnesota
Industrial Arts Assoc.

Dear Sirs,

I have a complete file of SCHOOL SHOP from Volume 1, Number 1 to the current edition. This is my last year in public-school work for I plan on retirement in June and I am wondering if you know of anyone who might like to buy a complete file of your good magazine. I don't imagine that too many complete files exist and there is a possibility that you might know of someone who might like to secure one.

*F. N. Newton, Jr.,*
Director, Industrial Arts,
Sharon, Penna., Public Schools

[EDITOR'S NOTE: The availability of Mr. Newton's file of SCHOOL SHOP is mentioned here so that anyone interested can get in direct touch with him.]

Dear Sirs,

. . . We in industrial education think you are doing a great service to us. SCHOOL SHOP is an interesting and informative publication and our teachers look forward to receiving each issue. Thanks for your interest and the service that you are bringing to us.

*John Standridge,*
Assistant State T&I Supervisor,
Topeka, Kans.

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## happenings in industrial education

### Industrial-Arts Scholarships

A NATIONAL Industrial Arts Scholarship Fund has been established by the industrial-arts division of the American Vocational Association, under the leadership of William R. Mason of Cleveland, A.V.A. vice-president for industrial arts.

Scholarships ranging up to $500 will be awarded to outstanding young men for the purpose of entering industrial-arts teacher education. Selection will be done through a national testing service after initial screening by the A.V.A. Industrial Arts Scholarship Committee, composed of Robert M. Worthington, St. Paul, Minn., chairman; Kermit Seefeld, University of California, Santa Barbara; Dewey Barich, Ford Motor Company; and Robert Thompson, New York University.

Contributions to the scholarship fund have been made by several leading school-shop supply and equipment firms. Additional information about the scholarships may be obtained from the A.V.A headquarters, 1010 Vermont St., N.W., Washington 5, D.C.


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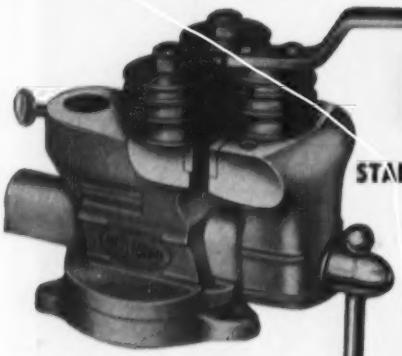
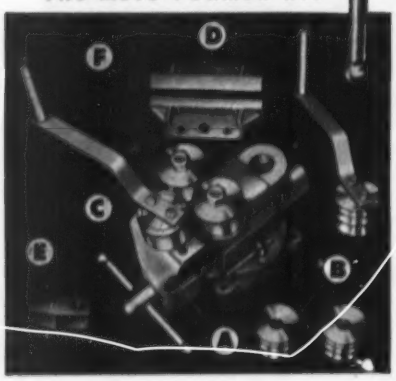


The Metl-Former, a new light-metal combination tool, opens a new educational phase of school shop activity—*easy, inexpensive metal working!* The versatile Metl-Former forms, rolls, and bends light metals with fingertip tension—changes raw materials into useful and instructive wrought-metal tables, planters, and lamps. It illustrates important metal-working principles and applications, simply and easily. No additional strength is required to operate the Metl-Former and changes from one operation to another are quickly made. Mistakes in metal shaping are quickly erased by reversing the operation, cutting *costly* scrap to a minimum. Instructive values of the Metl-Former are unlimited. There's *double value*, as the Metl-Former also serves as an *extra* shop vise.

THE METL-FORMER KIT




KIT CONTENTS

A. Basic Metal-Forming Tool
B. 3 Tubing and Rod Rollers
C. 3 Flat Metal Rollers
D. 1 Sheet Metal Bender
E. 1 Flat Metal Bending Wedge
F. 2 Roller Handles

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DRILL STAND ATTACHMENT—Slides into a drilled hole at rear of Metl-Former—makes a drill press of an electric drill.

Drill Stand Attachment

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Write for full information, today, about the new, instructive, metal-shaping tool, the Metl-Former, plus the handy group of optional accessories.


### New Jersey School Honored

A NEW Jersey National Guard unit has recently given a citation to the Glenfield Junior-High School, Montclair, N.J., for development of a cut-away automobile now being used to train Army reservists.

This is probably the first time that a military unit has used a training device built by teenage students anywhere, an Army spokesman has declared.

The car was made several months ago by auto mechanics shop students who stripped down a chassis, cut away metal parts, and replaced them with clear plastic so the operation of moving parts would be visible. The engine is connected with an electric motor so the operation of the various systems can be observed in action.

The cut-away automobile was designed by the pupils under the direction of John Le Rose, auto shop teacher.

### New Vocational School

A NEW vocational and technical high school, opened this school year in Trenton, N.J., provides opportunities for vocational and technical training in 15 different skilled and technical areas.

The new school is located on the campus of Trenton Central High School, permitting the use of the auditorium and health and physical education facilities.

Harry Lesslie, who has had much experience in vocational education, is director of the new school.

### Automechanics Grants

THE Automobile Manufacturers Association has approved grants of funds totaling $145,000 to three universities for scholarships and research aimed at relieving the nation-wide shortage of well-trained auto mechanics.

The three universities receiving funds are Wayne State University, Detroit, Michigan; the University of Illinois, Urbana; and the University of Michigan, Ann Arbor.

The grants to Wayne State University and the University of Illinois are for $2,500 each for scholarships for students to be automechanics teachers. The University of Michigan received $140,000 for a seven-year research project to establish criterions for determining the qualifications of a good mechanic.

Harry A. Williams, managing director of the Association, said the two projects are recommendations of the Automotive Industry-Vocational Education Conference, which is a cooperative working group composed of representatives of the American Vocational Asso-

# PARKS PLANERS Give Your Students Practical Experience on Popular Industrial Machines

Students learning on Parks Planers benefit not only from the safe, easy, and accurate operation of these planers, but also from the practical experience of working on the same type of high-speed, precision built planers they will eventually use in their trade. The Parks No. 20, 20" Planer (at right) has a 4-knife cutter-head with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M. or 40 and 80 F. P. M. Available with knife-grinding attachment at additional cost.

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At left is the Parks Heavy-Duty 12" x 4" Planer—a compact, sturdy thickness planer with feed speed of 16 F. P. M. at 4000 R. P. M. Will handle material as short as 6" and as thin as ¼". Both planers are priced low enough for even the most modest shop budget. WRITE FOR COMPLETE DESCRIPTIVE LITERATURE.

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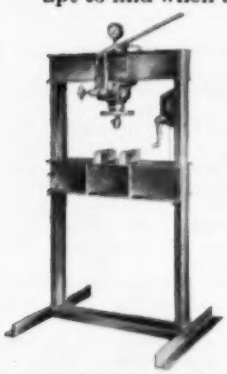

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ciation and the Service Managers Committee of the Automobile Manufacturers Association.

### New Facilities in Oregon

Two new buildings to house the automotive, body and fender, and diesel and tune-up classes at Eugene Vocational School, Ore., are scheduled for completion this month. Classes are to start in the new buildings in September.

The school reports that all day-trade classes at the school are filled to capacity and each class has a waiting list of prospective students.

### For Graphic-Arts Teachers

Graphic arts teachers throughout the country will be able to compete for eight special summer-school scholarships at Stout State College this year, according to a recent announcement of the Education Council of the Graphic Arts Industry, Inc.

Made possible by a $2500 personal contribution of Elmer G. Voigt, chairman of the board of Western Printing and Lithographing Company, Racine, Wis., the awards will finance the attendance of the printing teachers at Stout from June 23-August 1 for a course entitled "Technical Problems in Graphic Arts." Aim of the course is to improve graphic-arts offerings in the schools. The course may be taken for undergraduate or graduate college credit.


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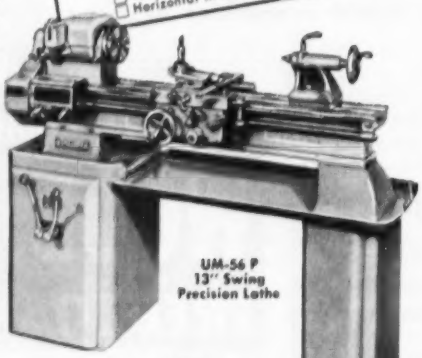
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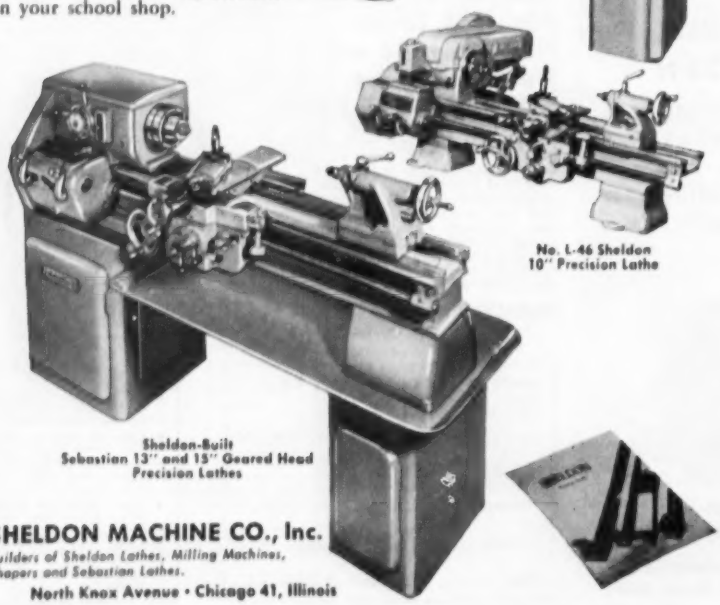
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### IA Project Round-Up

An industrial-arts round-up, sponsored by the Industrial Arts Club of Illinois State Normal University, will be held April 18-19 at the University for the selection of outstanding projects made by pupils in industrial-education classes in the state during the 1957-58 school year.

Awards will be given in crafts, drawing, electricity, metalwork, and open classifications in both junior-high and senior-high divisions and in drawing, metalwork, and open classifications in the vocational division.

### New Vocational School

The number of vocational and adult schools in Wisconsin was increased to 62 in January when the Oconto Board of Vocational and Adult Education offered its first classes. Richard Krueger is acting director.

### Art and Industrial Arts

"A Positive Approach to Problems of Art and Industrial Arts" was the subject of a conference sponsored by the vocational education department and the art department of the School of Education, New York University, scheduled to be held March 22. The objectives of the conference was to explore areas of common interest of art and industrial arts in philosophy, content, and application.

### Convention Calendar

**Washington Industrial Arts Association,** Western Washington College of Education, Bellingham, April 4-5.
**New York State Vocational and Practical Arts Association,** Hotel Syracuse, Syracuse, April 10-12.
**West Virginia Vocational Association,** Jackson's Mill, April 11-12.
**Nebraska Industrial Education Association,** Hastings High School, April 12.
**Michigan Industrial Education Society,** Civic Auditorium, Lansing, April 17-19.
**Wisconsin Association for Vocational and Adult Education,** Hotel Loraine, Madison, April 18-19.
**Connecticut Industrial Arts Association,** Teachers College of Connecticut, New Britain, April 25-26.
**American Industrial Arts Association,** Hotel Statler, Boston, Mass., April 29-30, May 1-2.
**Foundry Instructors' Seminar,** Case Institute of Technology, Cleveland, June 19-21.
**International Graphic Arts Education Association,** Stout State College, Menomonie, Wis., Aug. 3-7.
**American Vocational Association,** Buffalo, N.Y., Aug. 11-15.

### Teacher Strikes Gold

Bryan Hollands, a woodworking instructor in Sittingbourne, Kent, England, recently found 34 Roman gold

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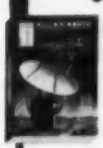

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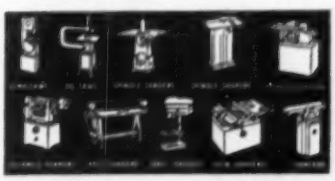

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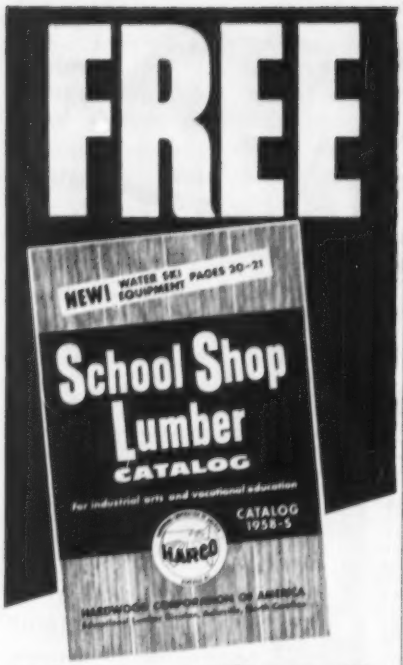


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coins, nearly 2000 years old, as he was digging a trench for a new home he was building. Declared a treasure trove, the coins will be disposed of by the British Museum as it deems fit. Mr. Hollands will receive 100 percent of their value. It is estimated that if sold on the open market, the coins would bring between $1500 and $3000. Their value simply as gold is approximately $450.

### Graphic-Arts Conference

INTERNATIONAL Graphic Arts Education Association has accepted the invitation of Lloyd Whydotski, head of the printing department at Stout State College, Menomonie, Wis., to hold its 33rd Annual Conference on Printing Education at the college, Aug. 3 to 7, 1958. Mr. Whydotski will serve as program chairman of the conference.

### Celebrate 25th Anniversary

THE Connecticut Industrial Arts Association will hold its 25th anniversary convention at the Teachers College of Connecticut, New Britain, on April 25th and 26th. Newly completed facilities at the college will be used for commercial and project exhibitions.

### Clinic Held at Fairmont

A clinic for industrial-arts teachers of West Virginia was held recently at Fairmont State College at Fairmont. Manufacturers' representatives discussed with the group various aspects of different types of shop machinery, and gave a demonstration on buffing, coloring, and polishing metal.

A similar clinic was held earlier in Charleston for teachers in the southern part of the state. The meetings were sponsored jointly by two machine manufacturers and the West Virginia state vocational department. ★

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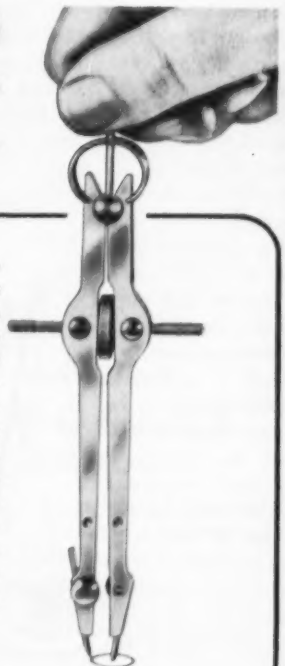

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**What the industrial designers are doing (One of a series)**

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**Manufacturer: KNOLL ASSOCIATES, INC., NEW YORK**

IN a number of pieces of contemporary furniture of wood, laminated members are used to add variety as well as function to the total effect. Such a case is found in this interesting table designed by Lewis Butler for Knoll. Beneath the walnut plywood top are four stretchers of laminated maple which give adequate bracing and are cleverly recessed to allow legroom. To do the work of these members, a similar supporting structure out of solid wood would have to be far heavier and more cumbersome and would destroy the table's light, easy-to-move appearance.

All too often we think of wood only as a marble-like material that can be cut away by different processes. We fail to take advantage of its significant property of bending and remaining stable after it is bent. This limited thinking is comparable to that of the craftsman in acrylic plastics who never heats and bends his Plexiglas or Lucite and therefore is totally unaware of the possibilities in design and construction which would be open to him.

There are several other points of interest regarding this conference table. Its 25½" height was carefully determined to "create a friendlier, more relaxed atmosphere . . . high enough to work on, and to serve lunch on should the conference last through the day." Like much of today's imported furniture it has an oil finish. The diameter is 54" and the price is roughly $190.—*Robert A. Tinkham, Associate Professor of Industrial Education, University of Illinois, Urbana.* ★

SURE IT'S PRACTICAL, I'M GOING TO BE A FIREMAN SOMEDAY."

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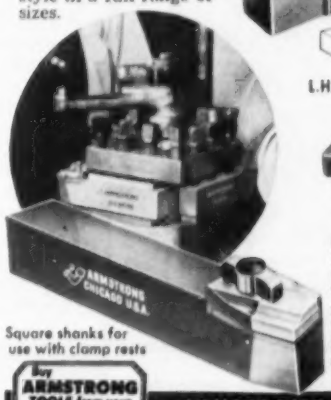

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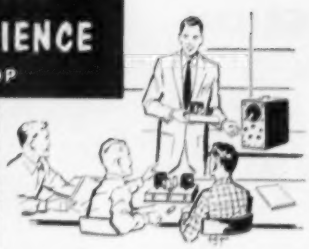

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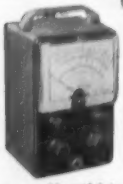

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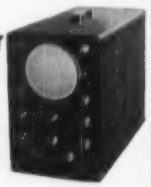

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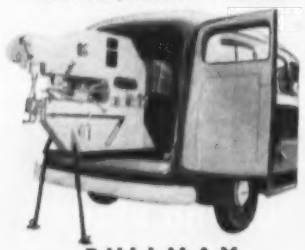

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# Diamond Dust

**Abrasive comments from that doughty Scot, Tom Diamond, former head, Department of Vocational Education, University of Michigan, Ann Arbor.**

## First the Egg

SAM SILVER had just graduated from high school. He had been exposed to several semesters of shop work in the junior-high school and he had spent much of his time during his last three grades specializing in machine-shop work. As a result of these experiences, he had acquired considerable skill in the manipulation of the equipment and materials common to the machinists' trade.

With this background he had acquired the feeling that he was ready to conquer the world and was now qualified to carry a journeyman's load in the trade of his choice. With this optimistic outlook on life, he presented himself at the employment office of a local firm and applied for a job as a machinist. The personnel director liked the look of the lad and the firm was hard pressed to find competent toolmakers, so it is not surprising that Sam found himself placed on the payroll.

Bright and early on Monday morning Sam reported at the plant and was assigned to the toolroom. The foreman was a gruff sort of chap who was not greatly impressed by the fact that Sam was a high-school graduate. "What can you do?" he asked the lad. Sam replied that he could do anything, meaning anything that involved the machining of metal.

The foreman had a suspicion that Sam, in his enthusiasm, had overstated his abilities, so he gave him a job which involved limitations in measurement of ten-thousandths of an inch. Sam had never been held to such close tolerances so, inevitably, he found himself in difficulty. Not only so but he could see greater difficulties ahead of him as he observed the things that were going on around him. He discovered, too, that time was an important factor which had not been considered in school, and that it was of primary importance in the production of goods.

Slowly but surely Sam began to realize that he was out of his depth. As this feeling was dawning on him, he was approached by the representative of the union about becoming a member. This gentleman wanted to know where Sam had served his apprenticeship and in

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what other shops he had worked. When Sam admitted that he had not had either of these experiences, he was informed that there were trade regulations which made it impossible for him to retain his new job.

In the meantime the foreman had discovered just what he had suspected. While the lad had ability, he was not quite ready for the work he had undertaken. However, both the foreman and the union representative were understanding individuals who had encountered similar cases in the past. They had a kindly interest in the boy and, since they had no desire to discourage him, they suggested that he transfer to the apprentice department of the company in order to extend his knowledge and skill, and at the same time meet the requirements of the trade.

Sam was pleased to be rescued from a difficult situation, and at the same time save his face, so the transfer was made. Now he found himself in a situation where his training was under the supervision of a representative of the union, whose responsibility was to insure that the lad's experiences in the plant was correlated with the technical knowledge he received in school.

The lad was happy in his new environment and he acquired a new sense of values. He learned that, while the instruction he received in school was good, it was not a substitute for apprenticeship. He was convinced, however, that it did provide excellent preparation for apprenticeship, and that there is much to be learned in a trade that can be learned only on the job.

What has been said about machine-shop work is just as true for other crafts where a high degree of skill is required. The example given merely represents the experience encountered by some pupils from various trade fields, who graduate from our schools, and who go out into the occupational world feeling that they are adequately prepared to function as skilled craftsmen. It is the responsibility of the school-shop teacher to correct these misconceptions. ★

### For Your Convenience

Pages 54-66 of this issue of SCHOOL SHOP contain the Suppliers Directory which you will want to save for ready reference purposes throughout the year.

Note that under the various headings from "Abrasives" to "Wrenches" you can find the names of companies that furnish practically anything needed for the equipping or supplying of a school shop.


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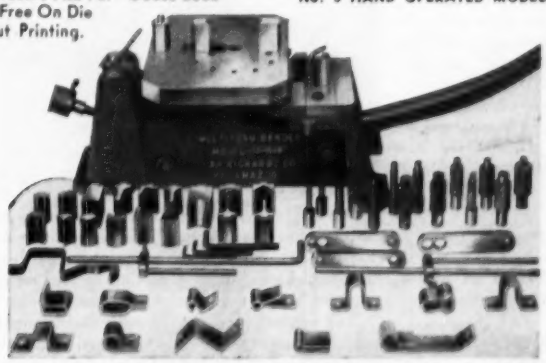

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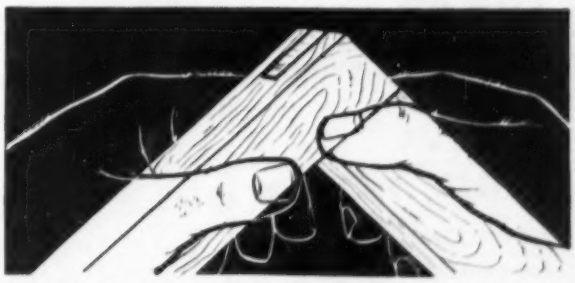

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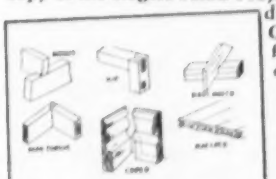

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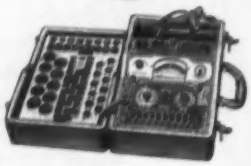

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# news from Industry

(Circle the numbers on the card in this issue to secure the items listed.)

## Sta-Put Holds Workpiece Steady as It's Worked On

Sta-Put, a holding device designed for the drill press and recently announced by the Cincinnati Tool Company, can be quickly adjusted to hold almost any shaped piece securely in desired alignment with the drill, according to the firm.

Available with either a wheel or lever handle, Sta-Put has a split collar that can be easily attached to a drill-press column. The company claims the device eliminates slipping, reduces breakage, spoilage of expensive material, cuts down on the danger of broken fingers and skinned knuckles.

For additional information write to the Cincinnati Tool Co., 4059 Montgomery Rd., Cincinnati 12, Ohio, mentioning SCHOOL SHOP; or *circle no. A-1 on the business-reply card.*

## Western Abrasives Announces All-Purpose Abrasive Wheel

The new Sand-O-Grind, recently announced by Western Abrasives, takes the place of numerous files, rasps, sandpaper, emery wheels, and buffing wheels, the firm claims.

The company goes on to say that it will remove paint from wood surfaces without filling up like sandpaper does, yet it will cut cement or the hardest steels.

Sand-O-Grind wheels are 3¾"-diameter disc-type grinders with arbor to fit any ¼" or larger electric drill.

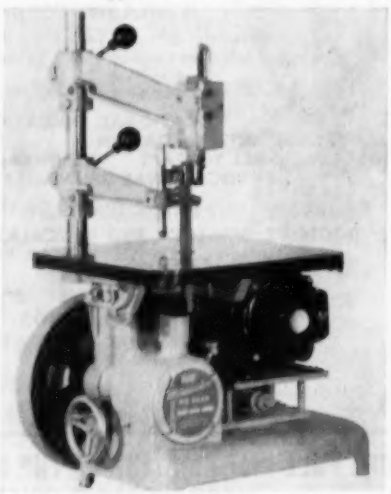
For additional information write to Western Abrasives, 2131 S.E. Sixth Ave., Portland 14, Ore., mentioning SCHOOL SHOP; or *circle no. A-2 on the business-reply card.*

## Rice Pump and Machine Adds Die Filer to Its Line

A Milwaukee die filer, Model FS-VSS, has been added to the line of die-making equipment offered by the Rice Pump and Machine Company.

The manufacturer claims that the machine has infinitely variable speed and adjustable stroke lengths. Through the adjustment of two controls, the speed may be varied from 100 to 475 strokes per minute and the stroke length from 0 to 2".

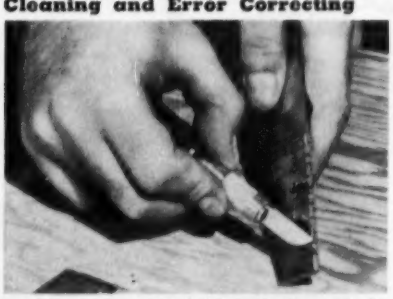
Other features named by the company are the offset upper and lower chucks of ball-



jointed construction for faster chucking and easier alignment of files, new and improved swinging overarms, choice of three sizes of four-way tilting tables, and an instant means for zeroing the tables.

For additional information write to the Rice Pump and Machine Company, Belgium, Wis., mentioning SCHOOL SHOP; or *circle no. A-3 on the business-reply card.*

## Typography Knife Speeds Cleaning and Error Correcting



A handy, replaceable-blade knife, made by X-acto, Inc., is gaining wide acceptance by the printing industry for removing excess lead flashing, burrs, and correcting minor errors on lead slugs, the company claims.

The razor-sharp, surgical-steel blade, mounted in an easy-to-grip handle, is used to remove flashing, hairlines, dead metal, and correct errors on the type face itself.

The company states that refill blades, costing no more than a few pennies, may be changed in a matter of seconds.

For additional information write to X-acto,

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4 STUDENT WALL SCIENCE TABLE

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The TWL-1260 combines maximum working and storage space, providing a truly efficient science center... adaptable to a wide variety of room layouts. Available with Tolco Carbonized or Tolstone top - both 1¼" thick.

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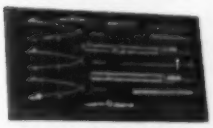

Berger Drawing Set #510 plus complete kit: $10.50

Prices quoted are for 6 or more kits. Instructors may buy sample kit at same low price.

**YOUR CHOICE OF 8 DIFFERENT DRAWING SETS—PLUS**

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| Protractor | French Curve |
| Engineer's Scale | Draftsman's Tape |
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| 8" Triangle (45°-90°) | 2 Drawing Pencils |
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**Choice of drawing sets . . . *plus***

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| 12" Triangular Scale | Pencil Pointer | |
| 6" Triangle (45° - 90°) | Drawing Pencil | |
| 8" Triangle (30° - 60°) | 2 Erasers | |

*Write for literature and complete prices.*

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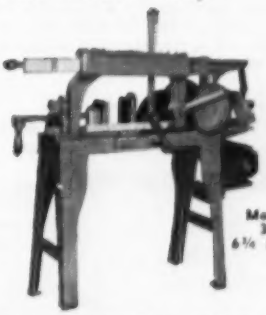

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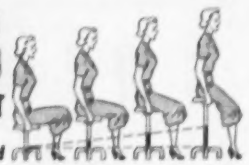

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Inc., 48-41 Van Dam St., Long Island City 1, N.Y., mentioning SCHOOL SHOP; or *circle no. A-4 on the business-reply card.*

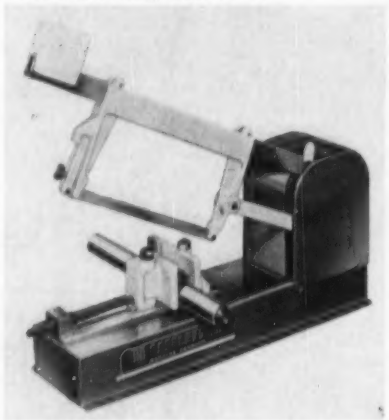
### New Probe Has Capacitive Network

An all-purpose probe with a built-in capacitive network and neon-type checker has been introduced by Kingston Electronic Corporation.

Called the Kingston Probe-Master, this instrument, because of its capacitive network, makes it possible to: bypass stages, check open condensers, couple signals from one stage to another in any circuit which selfgenerates a signal, and isolate a defective stage without outside signal-generating equipment.

For additional information write to the Kingston Electronic Corp., Medfield, Mass., mentioning SCHOOL SHOP; or *circle no. A-5 on the business-reply card.*

### Peerless Previews Three Sawing Machines



The Peerless Machine Company has announced three new products for 1958 production. They are: a high-speed production band saw which automatically regulates blade pressure to achieve 100 percent sawing efficiency at all times; a 6" x 6" Speedy-Cut sawing machine with a variable speed drive; and a 4" x 4" saw (above) designated the Handi-Cut, which is portable and cuts 20 times faster than hack sawing, while saving blades at a ratio of 30 to 1 over hand hack sawing, the company states.

The machines were previewed at Peerless' headquarters by 75 salesmen representing machinery dealers from coast to coast.

For additional information write to the Peerless Machine Company, Racine, Wis., mentioning SCHOOL SHOP; or *circle no. A-6 on the business-reply card.*

### Columbian Vice Announces New Line of Masons' Wood Levels

"Easy-read," no-glare oval lenses are the outstanding feature of a new line of 48" masons' wood levels announced by the Columbian Vise and Manufacturing Company.

The firm states that they are available in either kiln-dried sugar pine or genuine ma-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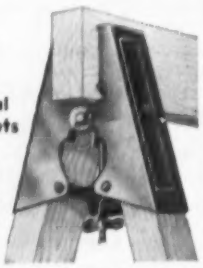

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hogany and have six metallic-sealed vials (four plumb and two levels). They are offered in both plain and brass-bound types with finger grips or open-hand grips.

For additional information write to the Columbian Vise and Mfg. Co., 9038 Bessemer Ave., Cleveland, Ohio, mentioning SCHOOL SHOP; *or circle no. A-7 on the business-reply card.*

### Seco Introduces Circuit Tube Tester

The Seco Manufacturing Company has recently introduced its Model GCT-8 Grid Circuit Tube Tester.

The firm states that this instrument has been designed to check the critical "control grid" condition of vacuum tubes and will provide as many as 11 simultaneous tests on a typical pentode such as the 6AU6.

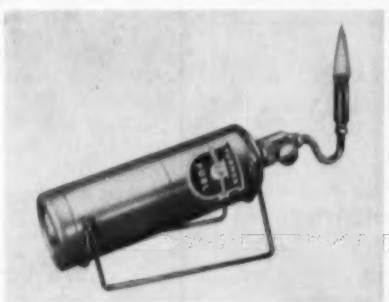
The unit, 6½" x 2½" x 6½", is easy to carry and store, the company says, and comes equipped with ten prewired sockets and one spare socket.

Seco also makes a Model 107 Tube Tester and Model FB-4 Flyback Circuit and Inductance Analyzer.

For additional information about these products write to the Seco Manufacturing Co., 5015 Penn Ave. S., Minneapolis, Minn., mentioning SCHOOL SHOP; *or circle no. A-8 on the business-reply card.*

### Turner Brass Announces Bunsen-Type Burner

Propane gas in standard disposable fuel tanks is the fuel source for the bunsen-type



burner manufactured by the Turner Brass Works.

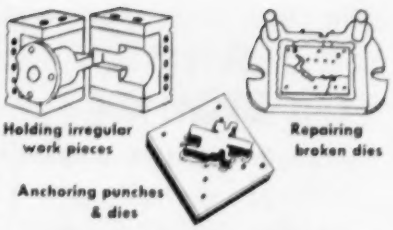
The company states the burner is all brass in construction and doesn't need any gas pipes or hosing. The firm adds the burner has one valve for precision finger-tip adjustment and the entire unit is UL approved.

It takes less than 30 seconds to replace the fuel tank and the entire unit is 5⅞" x 4½" x 14", the company says. Extra attachments include wingtop burner, grid top, wire-mesh burner, and heavy-duty burner.

For additional information write to the Turner Brass Works, Sycamore, Ill., mentioning SCHOOL SHOP; or *circle no. A-9 on the business-reply card.*

### Cart Complements Wells' Portable Saw

The Wells Manufacturing Company has made available heavy-duty, rubber-tired, ball-bearing wheels and a one-piece handle for use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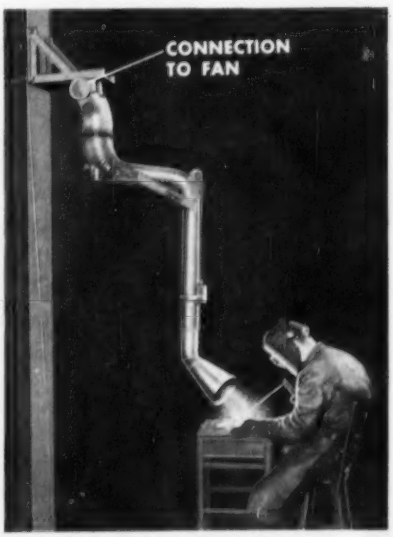


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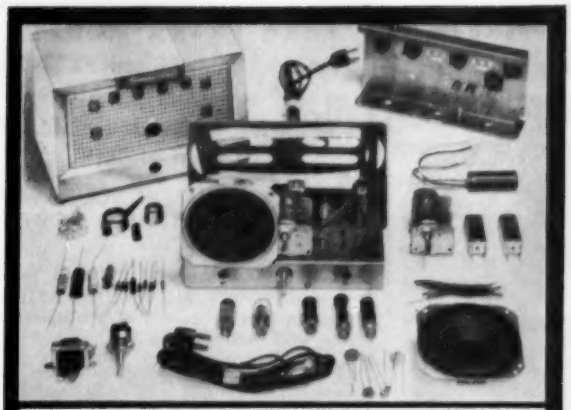

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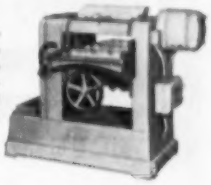

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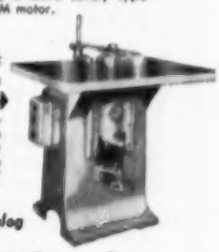
**HAND JOINTER**—compact and accessible. Built in 8" and 12" width. Table 6'2" long, maximum rabbet depth 9/16". Round, 3 knife safety type cylinder head, 3 HP 3600 RPM motor.



**SHAPER**—1" diameter spindle, with 4½" vertical adjustment, 36" x 26" table, spindle speed–8,500 RPM, floor space—34" x 37".

**BAND SAWS**—machine 20" diameter wheel illustrated. Floor space 24" x 36", horizontal capacity 20", vertical capacity under guide 11". Also 27", 32", and 36" machines available.

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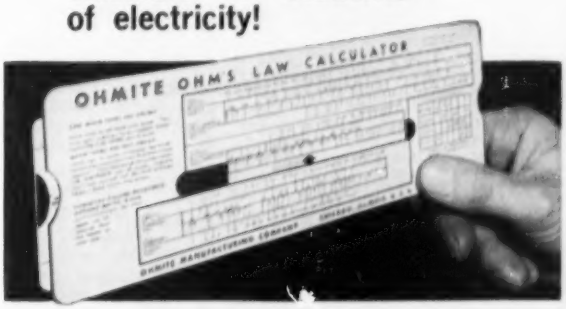


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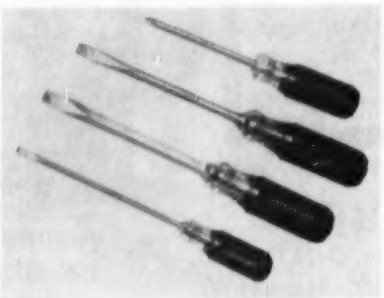
with its Model 49A metal-cutting band saw.

The company states that when the saw is in use, the handle is down out of the way, eliminating interference for the operator. The firm adds this portable unit can be used with the saws now in use.

For additional information write to the Wells Mfg. Corp., 2600 Shop Ave., Three Rivers, Mich., mentioning SCHOOL SHOP; or *circle no. A-10 on the business-reply card.*

### New Screwdriver Features Neoprene Cushion Grip



The screwdrivers recently announced by the Bridgeport Hardware Manufacturing Corporation feature a neoprene rubber grip permanently bonded to a tough amberlite handle, the company states.

The firm asserts that the grip is unaffected by water, oil, and gasoline. The company also states the screwdrivers have a 50 percent greater torque than ordinary plastic- or wood-handled screwdrivers.

For additional information write to the Bridgeport Hardware Manufacturing Corp., Bridgeport, Conn., mentioning SCHOOL SHOP; or *circle no. A-11 on the business-reply card.*

### Tolerton Introduces Three New Products for Shops

Three new items for use in school shops have recently been introduced by the Tolerton Company.

They are:

A ceramics unit (top photo)—the Tolerton T-C28 is designed to fit the floor plan of any crafts class and can be arranged in a variety of arrangements, U, L, or continuous. The dimensions are 12' x 28" x 32" and the unit comes equipped with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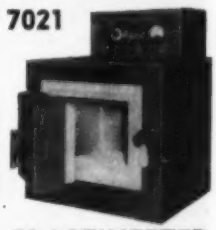

**SPECIFICATIONS**

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|---|---|---|---|---|
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No. 600

| Model | Interior Size | Exterior Size | Wattage 110V AC-DC | Shipping Weight | F.O.B. |
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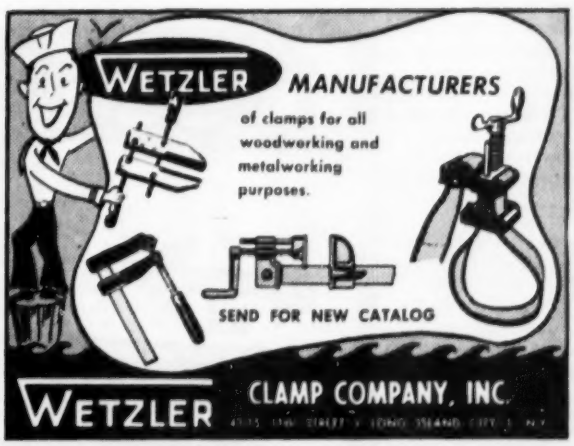


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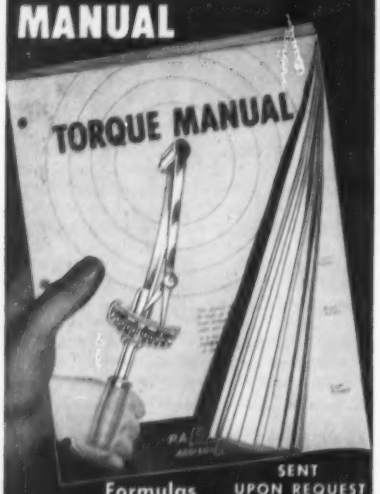


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Tote tray cabinet (bottom photo)—the TT-24 provides individual space for 24 large, heavy-duty plastic tote trays which can be tagged with names or numbers on slip tags; dimensions are 48" x 47" x 22" deep.

For additional information write to the Tolerton Co., Alliance, Ohio, mentioning SCHOOL SHOP; or *circle no. A-12 on the business-reply card.*

## *New Literature:*

**Knockdown Kits** is the subject matter of Giles and Kendall's new multicolored catalog. It shows the variety of kits in completed form and is available from Giles and Kendall, Huntsville, Ala., mentioning SCHOOL SHOP; or *circle no. A-13 on the business-reply card.*

**Standard Eye and Respiratory Protective Equipment** is the name of the new brochure published by the American Optical Company. It shows different kinds of protective devices suitable for various shop operations. It is available from the company at 2 Mechanics St., Southbridge, Mass., mentioning SCHOOL SHOP; or *circle no. A-14 on the business-reply card.*

**Catalog #F-7** is the title of the new rotary-tool manual published by the Precise Products Corporation. It is 48 pages long and offers every kind of rotary cutting tool from H.S. steel to carbide, abrasives, and diamond. It should be of help to rotary-tool users in selecting the right tool for a particular job. The manual is available on request from the firm at Racine, Wis., mentioning SCHOOL SHOP; or *circle no. A-15 on the business-reply card.*

**What's So Different about Deft?** is one of the new Desmond Bros. publications dealing with Deft wood finish. It is made up of cartoons and is 24 pages long. It is available by writing to the firm at 1826 W. 54th. St., Los Angeles, Calif., mentioning SCHOOL SHOP; or *circle no. A-16 on the business-reply card.*

**Color Chart** and **Surfacers** are two folders of the Webb Products Company describing its surface-finishing materials. Multicolored, they are available from the Webb Products Co., Norcross, Ga., mentioning SCHOOL SHOP; or *circle no. A-17 on the business-reply card.*

**RCA Electronic Trainers** is the name of RCA's new catalog on electronic training devices originally developed for the U.S. Armed Forces but which are now available to high schools and schools with T&I programs. The two pieces of basic equipment described in the catalog simplify training in fundamentals, AM and FM radio, television microwave, radar, sonar, synchro, etc. Complimentary copies are available from Mr. J. Kingan, Mgr., Training Devices and Programs, Bldg. 201-1, RCA Service Co., Camden 8, N.J., mentioning SCHOOL SHOP; or *circle no. A-18 on the business-reply card.*

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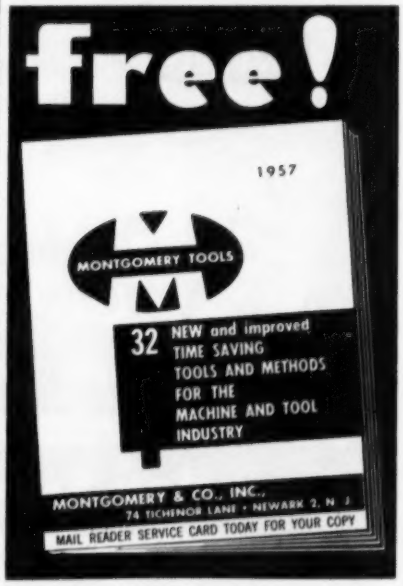
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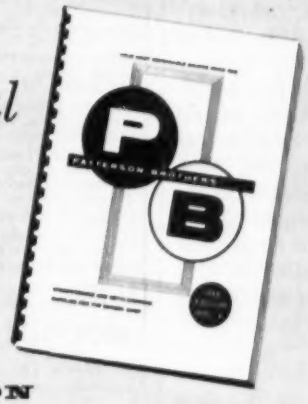

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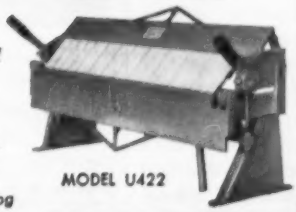

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## Washington . . . *from page 120*

cilities which had been deteriorating long before Sputnik. The Murray bill is for the long pull. This measure says little about science, math, or technology. It is not, like the Hill bill, designated as a "defense education act"; it is a "school assistance act." It is broad, general, flexible—it simply asks for federal grants to states for teacher salaries, construction, and equipment. The NEA likes and supports this measure for the very reason that it is not geared to "any emergency but rather to the basic needs of education." The other bills, the NEA thinks, are like patches on a roof of a house when its foundation should be reinforced.

**Urgency Has Waned.**—The hearings on these measures are lengthy, drawn out, leisurely. The statement of the U.S. Commissioner of Education required more than 15,000 words—and that on the Smith bill alone. The testimony of the NEA's Executive Secretary required close to 8,000 words, even though it dealt only with the Murray bill. When witnesses get into the act of comparing the three sets of measures, the record of testimony gets thicker and thicker.

But the Congressional subcommittees appear in no hurry. They have set no dates for ending the hearings and, in between long recesses, are willing to explore every phase of educational, scientific, or research needs.

The urgency to do something about and for education—so high in January—has fallen off in March. Two reasons are given: the certain success of our own satellite, the Explorer; and the uncertain conditions of our economy.

The Explorer, in the opinion of some legislators, shows that we are not as bad off in technology, science, and education, as the alarmists had shouted. The dip-and-drop in the economy, in the opinion of others, makes it hard to know what to do for the public schools. If unemployment worsens, the Democrats may push through a public works plan which will include aid for school construction. The Republicans hate the very thought of this. Their construction plans include the renovation of post offices (Pres. Eisenhower has proposed a two-billion dollar plan for this purpose); but they are convinced that local and state authorities are doing very well

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Pages 54 through 65

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Because of uncertainties and conflict in points of view, Congress is back to a familiar posture—wait-and-study. This delay serves to bring out more legislative proposals almost daily; to coalesce differences of opinion; to encourage controversies. The Washington air is thicker today with all these than it has been for two decades.

**"Informal Associations."**—The White House scheme to repeal the vocational-education acts and to end federal grants for this purpose has engaged—informally—the interest of an important Congressional subcommittee. We say "informally" because the subcommittee on intergovernmental relations (its formal name) will not have jurisdiction over the bills to kill the Smith-Hughes and George-Barden Acts when and if such bills are ever introduced. But the subcommittee watches all grant-in-aid programs and it became concerned over the President's repeated assertions in the budget message that he plans to ask for an end of the vocational grants by 1960.

The chairman of the subcommittee is Rep. L. H. Fountain (D. N.C.). One day in February, Mr. Fountain invited the co-chairmen of the Joint Action Committee to answer some questions on the proposal they had cooked up. To refresh your memory, the Joint Action Committee is made up of Administration officials and state governors. The co-chairmen are Robert B. Anderson, Secretary of the Treasury, and Lane Dwinell, governor of New Hampshire. The proposal these two gentlemen and their staffs had cooked up would transfer out of Washington all responsibility for vocational education. A part of the federal tax on local telephone service would be given up by the Treasury to be used by the states, if they so decided, for continuing their practical education activities.

As chairman of the subcommittee on intergovernmental relations, Mr. Fountain wanted some things cleared up. The two distinguished witnesses were co-operative. Mr. Anderson repeated the view that federal financial support for vocational education "is no longer necessary." Mr. Dwinell said the state governments are regaining their leadership and can very well become sole stewards of vocational education. And both witnesses stressed that a portion of the local phone tax is a logical revenue for financing vocational education. They claimed it was "a simple tax, uniformly distributed."

At this point, Mr. Fountain took over. He proved that the phone tax is not uniformly distributed. He said that 98 percent of Connecticut homes have phones, contrasted with only 40 percent in Mississippi. Per capita, the phone tax yields over $2 in each of the ten richest states; but considerably less than $2, and down to 95c, in the ten poorest states.

He continued: If the federal government turned back a portion of the phone tax to the rich states, they would indeed get a fat sum of money. But the poor states would get less, in many instances, than they get from the grants they would be forced to give up.

When Mr. Fountain warmed up to his demonstration of facts, it took him no time to prove that New York would obtain $22.5 million from the phone tax to carry on functions for which it now receives $5.1 million in grants. California would get $16.3 million to re-

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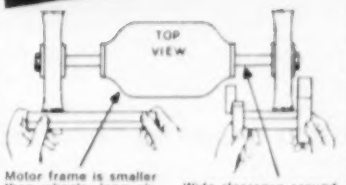
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place $3.9 million in grants. "In other words, the phone tax plan would produce more than four times as much as these two states would need to carry on their vocational activities," Mr. Fountain said. By contrast, Mississippi would get $800,000 out of the phone tax, whereas it is getting $2.1 million in grants; and North Dakota would get $300,000 from the phone tax to carry on programs for which it is receiving $991,000 in federal grants.

"A large number of states," Mr. Fountain said, "would not obtain enough revenue to compensate for the discontinuance of federal grants. A handful of states would obtain much more . . . What is your reaction to that, gentlemen?" Mr. Fountain asked, looking at the two co-chairmen.

The co-chairmen exchanged glances and their not-too-coherent replies went something like this: "You have put your finger on one of the most difficult problems with which we are confronted—that is, the balancing of equities between the 48 states as they seek to give up federal grants and reassume their leadership in paying for vocational education. . . . The phone-tax plan is not a perfect answer . . . We may never find a perfect answer . . . But if we say that no function can be returned to the states until we find the perfect plan, we'll never act . . ."

A sacrifice has to be made by some states, the co-chairmen continued, and no matter what federal tax you relinquish, some states will benefit thereby and some will be hurt. But a start has to be made.

Not entirely convinced, Mr. Fountain thanked the two co-chairman for presenting their views before the subcommittee. The significance of this confrontation is that it reveals the sympathies of this Congressional group as firmly lodged with vocational education as it is now administered. And this face-to-face talk between an inquiring legislator and the co-chairmen of the Joint Action Committee further showed that if the transfer of the vocational programs is carried out, some would be weakened, hurt, or even strangled in the process.

**From Iron to "Lacy."**—On January 27, the United States and Soviet Russia signed an agreement to bring about more East-West contacts. Could this agreement possibly result in East-West contacts among vocational educators?

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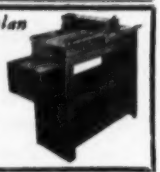

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of delegations. I'd like to see the two countries exchange shop teachers, teacher-trainers, and leaders in all phases of vocational education. It may well be that the time for such a step is now ripe."

If you've seen the text of the agreement, you have probably discovered that almost anything, by way of exchanges, is possible under its terms. The two countries *could* exchange teachers, pupils, state department of education officials, apprentices, and apprenticeship trainers. They *could* exchange films, textbooks, and teaching manuals. They *could* exchange weight-lifters and chess-players; orchestra conductors and entire orchestras; painters, sculptors, and student newspaper editors; 4-H club members and groups of future farmers.

The possibilities exist under the agreement—the question is, will anything happen? And, if so, when and how; and who is to make anything happen?

We talked to the State Department's staff on East-West contacts. We learned that nearly all activities under the agreement are to be arranged, paid for, and followed through by "private"—that is, nongovernmental—effort. The government simply unlocked the door. Educators will have to turn the knob, open the door, and pay their way in.

We learned further that exchanges are not easily arranged. The first task for American educators is to find their almost exact counterparts in the U.S.S.R. who are willing and able to come here. Next task is to map out a tour for the American delegation to follow in Russia and to agree on an "equal and equitable" tour for the Russian delegation in the United States. "Everything has to be on a strictly reciprocal basis," one State Department official said. "If you want to visit a print shop in Kiev, you'll have to arrange for the Russians to visit a print shop in Baltimore or a city of similar size. If the Russians pay for your vodka in Gorodenka, you'll have to pay for their Scotch in, say, Bridgeport."

State Department officials at the "working level" advise caution and careful preparation in arranging contacts with the Soviets. But at the "policy level," officials are urging educators to get moving. The policy level is best represented by William Lacy, our Ambassador, who spent three months reaching an agreement with the Russian Ambassador Zaroubin. Mr. Lacy takes the agreement seriously. "It is no decorative frill on the edge of our foreign policy," says Mr. Lacy, referring to the agree-


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ment. He admits that caution, understanding, and meticulous planning are needed to make an exchange possible. Educators may experience delay and frustration as a result of State Department or Russian action—or inaction. But, smoothing his bright-red mustache, Mr. Lacy adds with a twinkle: "Anyway, isn't it better to have a Lacy Curtain than an Iron Curtain?"

**By the Back Door.**—The controversy over using federal funds to build classrooms has taken on new life. A new proposal is not really a school construction bill, but it could help alleviate the classroom shortage. The measure (S. 3231) is actually an antirecession bill.

Sponsored by Sen. Albert Gore (D. Tenn.), the bill provides for the establishment of a Public Works Administration to coordinate public works projects —including school construction—in areas of heavy unemployment. Senator Gore concedes his proposal was never intended as a solution to the schoolhouse shortage. Its focus is strictly on providing jobs for the unemployed.

**Graduate Study.**—The present master's and doctoral programs in the nation's colleges and universities are under criticism. Complaints include the fact that the present methods are sterile, that it takes far too long for the average student to get a master's or doctor's degree, that too much emphasis is placed on the research or thesis side of the Ph.D., and that the Ph.D. program is often too rigid and regimented.

One educator, Dean Jacques Barzun of the Columbia Graduate Faculties, asserts, "The time spent in making professional scholars is too long for the result achieved. ★

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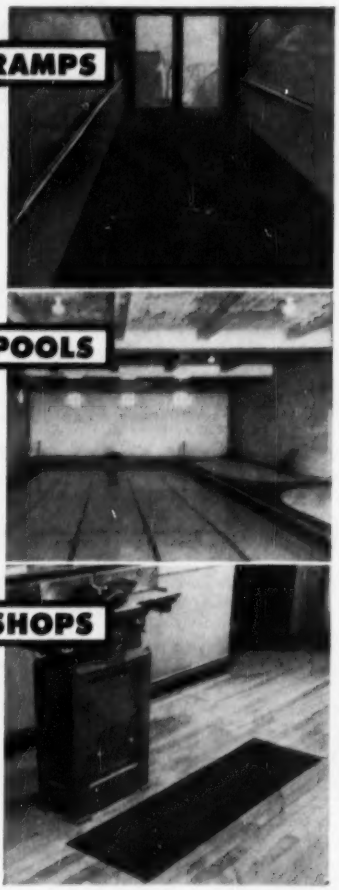


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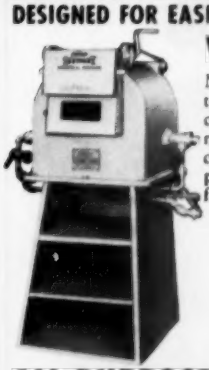

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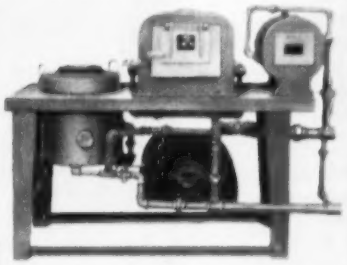

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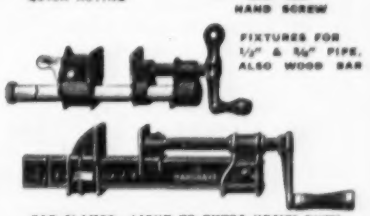


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*Compiled by C. Weingartner, Head, Machine Shop Dept., David Ranken Jr. School of Mechanical Trades, St. Louis, Missouri.*

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# from Washington

*by Michael Paca*

**The Big "Three."**—Of the three-score bills dealing with education which are now before Congress, only three are "major." The first of these is by Sen. H. Alexander Smith (R. N.J.), who introduced the Eisenhower-Folsom proposals. The second is by Sen. Lister Hill (D. Ala.), who believes the Administration bill does not go far enough. The third is by Sen. James Murray (D. Mont.), who has taken an approach sharply different from that of the other two legislators.

Each of these bills has a counterpart in the House. But in addition to these "Majors," Congress is spawning a host of minor bills—that is, measures by legislators who have no backing from educational interests. So numerous are the bills that Congressional committees studying them have grouped them, unofficially, as (1) those relating to the "emergency" created by Sputnik; (2) those relating to the intermediate future; and (3) those relating to the long pull.

Thus, the Smith bill is designed to meet the "educational emergency" some people discovered when Russia launched its satellites: it deals primarily with science-math-scholarships. The Hill bill goes a little further—seeking, in addition, to bolster somewhat the school fa-

*(Continued on page 116)*

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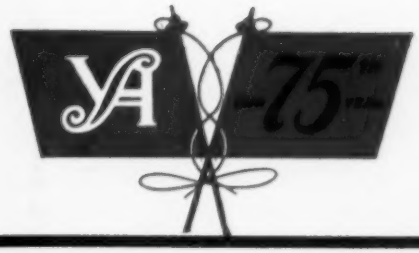


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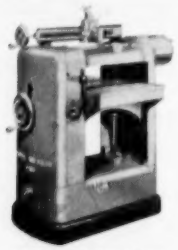

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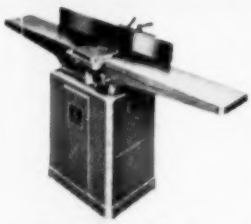

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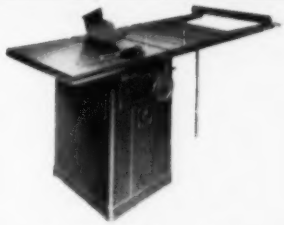

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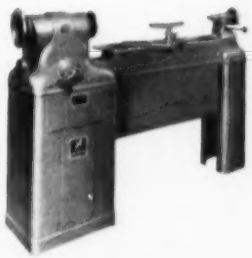

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